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AVIATION WEEK

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Avionics Industry
•
Report on Space
Scientists in Rome

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Sept. 24-26—American Rocket Society, full meeting, Hotel Statler, Buffalo, N. Y.
Sept. 24-25—1956 Intra-Lam of the Atomic Industries, Navy Pavilion, Chicago 11
Sept. 26—National Society, Industrial Assn., Waldorf Astoria, New York City
Sept. 27-28—Fourth Michigan Accounting Conference sponsored by Michigan Association of Airport Managers, Muskegon

Sept. 25-28—Southern California Engineers' Engineering Conference: 8 Exhibit sponsored by Engineers and Architects' Assn., San Diego Chapter, Ballina Park, San Diego, Calif.

Sept. 28—New England Regional Workshop: Air Display of "Innocent Helicopters" by Capt. Manolop August, Hartford, Conn.

Oct. 13-17th Annual National Electronics Conference: sponsored by American Institute of Electrical Engineers, Institute of Radio Engineers, Union Institute of Technology and Illinois and Northeast on University Hotel, Sheraton Club.

Oct. 1-1996) aircraft Spark Plug and Ignition Components, Scott Hotel, Island, Okla.

On: 1-Institute of Automotive Engineers,
National Scientific Meeting, Aircraft
Production Forum and Engineering De-

Oct. 15-1956 National Academy Conference, Univ. of Oklahoma Norman Okla

Oct. 1-8—Arranged Communications

Oct. 5-10—Third jointly sponsored annual International Conference of Neurosc Society of Maryland and European-American

Oct 1812—*South of Laramie, Wyoming, United States*

Oct. 16/12-16—National Advisory Commission for Aeronautics, technical inspection of

Oct. 29-M—Aircraft Electrical Society. Aircraft Equipment Display. Fort Peck, in downtown Los Angeles, Calif.

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Vol. 68, No. 13

Published weekly, this is a 360-page book, the first of its kind in the world. The publication is available in 11 languages: English, French, German, Italian, Japanese, Korean, Spanish, Chinese, Russian, Arabic, and Hindi. It is published by the World Bank, 1818 H Street, N.W., Washington, D.C. 20036, U.S.A. The book is available for sale at a price of \$10.00 per copy. It is also available for loan to libraries and institutions. For more information, contact the World Bank, 1818 H Street, N.W., Washington, D.C. 20036, U.S.A. Tel: (202) 476-6000. Fax: (202) 476-6001. E-mail: pubs@worldbank.org. Web: <http://www.worldbank.org>.

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PRESENTS

6 MILESTONES IN AVIATION



Bird Boy Art Smith

Whenever dining-tables of pioneer aviators are chronicled, the name of Bud Day Art Smith is sure to appear. From the time he flew his first Camero-type biplane in 1911 until his death in 1926, Art Smith dedicated his life to aviation.

The romance of his life was heightened by the unselfish encouragement of his mother and father, who mortgaged their home so that their son could have the money to build his first airplane. Another inspiration of his early years was his sweetheart, Aimee Coon. They eloped in 1912 in what is considered to be the world's first airplane elopement.

Flying in such places as Deadwood, S. Dakota, and in the capital of Japan, Art Smith set the world record for looping the loop, powered sky writing and invented dozens of breath-taking stunts to win acclaim of millions throughout the world.



Phyllis, *Teacher of English as a Second Language*



AVIATION PRODUCTS



The custom of showing admiration for Art Smith is living by giving him a medal started with a flight he made in the Black Hills in 1912. One of his most prized awards was a gold medal, given him by his hero, Buffalo Bill.

It's Performance that Counts!
A name is only as good as the performance it represents.

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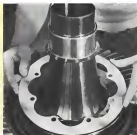
In aircraft tests, it's performance that counts. And military and commercial operators know they get super performance from F4U's *de Havilland*.

AVIATION DIVISION
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"We use Laminum to provide precise spacing between the transmission and the landing gear cut-outs on the strut."



"This .10" Laminum Shim is pressed to exactly .040" in thickness, and we do it in a matter of minutes."



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Aircraft Producers advise... "as tolerances

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"We join this leading edge wing spar in 4 places, and the Laminum Shim at each place assures maintaining the SCL of the wing."



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The demand for Laminum Shims has grown so much during the past few months that we wondered just exactly why, where and how they are being used so extensively. We got the question to assembly specialists in major aircraft plants, and here are their answers... just what we say, but what they say about the use of Laminum Shims in modern aircraft production...

"Our act. (basic contour line) is maintained to precise specifications with Laminum Shims. Without these, the wing components would tend to twist with the forces of modern jet flight."

"Shims must be flat for a close fit, which we always get with Laminum Shims. As tolerances become tighter, Laminum is a must to maintain production schedules."

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"Laminum Shims wear out about the same as solid shims. But they eliminate material losses. Reduce inventory and handling. Streamline production."

LAMINATED SHIMS OF



are custom-made precisely to blueprint! Laminums are completely surface-bonded to look and act like solid metal, yet quickly press down to a precision fit right at assembly. Available in Brass, low carbon steel and Type 304 Stainless, with .002" or .005" thicknesses. Also in Aluminum with .002" thicknesses. Laminum Shims eliminate costly extra operations: no machining... no grinding... no stacking... no making. And no grik between layers... ever!

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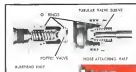
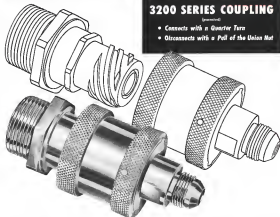
Aeroquip Announces a **NEW**

3000 PSI. Self-Sealing Coupling

3200 SERIES COUPLING

(continued)

- Connects with a Quarter Turn
- Disconnects with a Pull of the Union Nut



DISCONNECTED COUPLING with relief bleed. The ball valve cover slides along the hose. 1/2" rings provide an airtight seal and fully attached ball to support valve and transfer valve stress. All coupling parts are precision made from carefully selected materials.



COUPLED COUPLING, when nut is tightened, both valves slide closed. Note how the poppet in the ball valve slides along and mates with the sleeve and the ball valve in the hose attaching nut to prevent air from leaking system.



- SAFE**... may be checked visually at instantly for locked position.
- SIMPLE**... there are only 13 parts plus "O" rings and lock-up rings.
- FOOLPROOF**... there is no stable intermediate position where the coupling is partially open and unsealed.
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- NO AIR INCLUSION**... the coupling cannot admit air into the fluid system during connection and disconnection.

Designed to meet the requirements of proposed military specification MIL-C-25427

It took Aeroquip to improve an Aeroquip Self-Sealing Coupling!

The new 3200 Series Self-Sealing Coupling offers the same basic advantages for which Aeroquip Couplings are well known: HD fluid loss upon disconnection, HD air inclusion during connection. In addition, it offers plus advantages that contribute to improved design, maintenance, and service of overall.

It's fast acting! A single quarter-turn of the union nut fully connects the hoses and assures full flow of fluid. An equal pull on the union nut disconnects the coupling, forcing the valves to spring open instantly with valves closed.

It features visual and manual check for locked position!

By noting the position of the locking hex, or attempting to turn the union nut, or by tugging on the attached hose line, anyone can tell whether the coupling is fully connected. Once connected, the coupling cannot unlock accidentally during normal service.

It features simplicity of design... provides maintenance! Developed especially for use on modern aerospace and engine hydraulic systems up to 3000 psi, the 3200 Series Self-Sealing Coupling is highly recommended for use wherever hoses must be disconnected while systems are operational.

For further information, write for Engineering Bulletin AER-1.

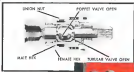


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LOCKING NUT TIGHTENED during quarter-turn movement. Poppet valve is displaced and tubular valve is closed. There is no leakage path in this position, as at any time during the placement of valves.



FULLY COUPLED AND LOCKED, when nut is tightened, both valves slide closed. Note how the poppet in the ball valve slides along and mates with the sleeve and the ball valve in the hose attaching nut to prevent air from leaking system.



Announcing...

FENWAL'S NEW JET ENGINE HARNESS AND INTERCHANGEABLE THERMOCOUPLES, PROVIDING

- Operation at temperatures over 1200°F
- Foolproof installation, simplest maintenance

A NEW CONCEPT IN TERMINALIZATION

Fenwal's new concept of Button Terminalization for integrated assembly of thermocouples and harness allows a new ease of installation. Only two bolts—and buttons make firm, reliable electrical contact! It can actually be installed in 15 minutes by a mechanic who has never seen it before. All the thermocouples are offset—and can only be installed in one way. And should a thermocouple go bad all you have to do is remove two bolts and insert another thermocouple. And that's a great advantage in maintenance.



DIFFERENTIAL EXPANSION NO PROBLEM

Fenwal's new Button Terminalized harness is rigid, yet flexible enough so that differential expansion will not cause difficulty. It is so designed that even when bolted in place the harness is flexible enough so that no great strains are placed upon the thermocouple bases or mounting bases for the harness. That means holding brackets do not have to be "bolted up" in order to withstand large forces due to differential expansion.



SOLID STAINLESS STEEL CASING PROTECTS WIRES

Ross the wires on the Fenwal harness are encased in an insulated blanket and mounted in a stainless steel covering. This prevents the wire from becoming frayed and corroded during installation or from vibration while in use.



BALANCED RESISTANCE HARNESS

The resistance path from each thermocouple to the indicator is equal, minimizing potential cross-line currents and enabling maximum accuracy.



ENGINE TEMPERATURE INDICATION AND/OR CONTROL



WRITE FOR ALL THE FACTS

Fenwal's new concept of its terminalized harness and thermocouples may be of great service to you. Write for complete facts now, to Fenwal Inc., Aviation Products Division, 189 Pleasant Street, Ashland, Mass.

Fenwal's new Button Terminalized thermocouple and harness assembly is ideal for indicating temperature. It is also used the control because of the great reliability of the Fenwal thermocouple. In fact, Fenwal thermocouples and harnesses can be used on any size gas turbine aircraft engine. They will withstand ambient temperatures over 1200°F.



Controls Temperature ... Precisely



How Holley's Compressor Governors Help New Jets to Supersonic Speeds

"City-saver" Air Force men call them, the J-45-powered F-100, F-101, F-102 and Navy F-4H, with level flight speeds faster than sound. And city-saver they could well be. Certainly their rapid approach to the fringe of Mach 2 heralds a new era in the progress of jet flight.

Sharing in the development of this new breed of supersonic fighters, Holley engineers, working closely with Pratt & Whitney Aircraft on the J-45 engine, designed the compressor bleed governor.

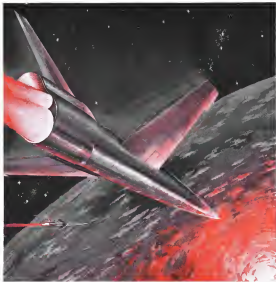
This new Holley compressor bleed governor is one more example of Holley's continuing leadership in the design, development and manufacture of superior engine control systems for both military and civilian use.

*Look to the
Holley
for the
design, development,
and manufacture
of superior jet
engine control systems.*



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A-14



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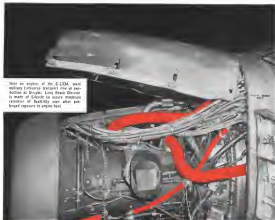
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FACTS

about

NEW DEPARTURE
BALL BEARINGS



FOR AIRCRAFT TURBINES

High speeds, high temperatures and heavy loads... both radial and thrust... characterize bearing applications for turbines used in present ultra-fast aircraft.

New Departure's Aircraft Bearing Research Program has produced ball bearings for highly satisfactory operation in small, medium and large turbines and their accessories.

Under this program, ball bearings of different steel dimensions stabilized for high-temperature operation have been developed and produced. Needs for bearings with high-thrust capacity and varied lubricating methods have been met. And, bearings with various geometrical specialities to satisfy difficult mounting and operational requirements were designed.

Beyond this, New Departure is working on bearing developments for the more powerful, faster aircraft of tomorrow.

For further details, send for Folder TB, on turbine bearings.



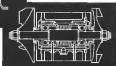
Split Ball Ring
Male Shaft Ball
Bearing



Accessory Ball
Bearings



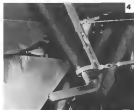
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EDITORIAL

IATA Faces the Issues

The dining of bagpiper has hardly died away in the north, as at Edinburgh Castle, but delegates to the annual general meeting of the International Air Transport Association already hear the rick of caterwauls and trumpet fanfares of the ball ring that is in store for their next meeting in Spain. The 12th annual general meeting in Edinburgh was notable for several reasons.

First there was the superb hospitality of the host British airlines—British Overseas Airways Corp., British European Airways, Hunting Clu and Aerow. Everybody who participated in the IATA program, from the host of the strutting military tatos on the purple grounds of Edinburgh Castle to the final formal ball, will join in congratulating the British host airlines on a job well done.

Second, there remains a marked air of fatalism in the face against the problem of improving the air transport system. To get on with this job of cooperation, the technical working group will meet in Moscow. The technical side of IATA is well into its program to improve the air jet. They are working closely with the International Civil Aviation Organization. The full text of the technical committee report presented by Capt. Anatoly Voronovskiy, executive vice president of Siberian Belarus World Airlines, merits close study by both operations and management executives of airlines in the world over.

No Place for Political Boundaries

We think one of the most significant points in the report is the first visual trend to show an increase in traffic control based upon national political boundaries. This use of political boundaries in air traffic control procedures has an impact on commercial aviation, even with the 300 mph speeds of current jetson powered aircraft. It will become downright dangerous with the advent of 400 mph turbojet engines and 500 to 600 mph subsonic transport. As the IATA technical report mentioned, even now an aircraft has often passed through one of these artificial control areas before it has room of proper clearance. The combination of aircraft speed and communication delay makes the a situation occurrence in Europe's airline corridors.

The technical committee also recommended that future air traffic control systems should be based upon area rather than route concept. We already can see how the technical capabilities of current aircraft, such as the Lockheed 1049, Douglas Service Star and Bristol Britannia have made traditional enroute concepts obsolete. A switch from route to area control is an absolute must if airline operators are to achieve maximum operational flexibility from their new equipment and give the traveler what he really wants: the most efficient and economical service.

Another point worth noting is the technical content of the report. It is full of international cooperation in the development of new navigation and traffic control equipment, with large scale evaluations conducted jointly by all the governments involved. This contrasts with the past procedure of developing national nations to the point of operational use and then trying it out on

informatics basis all over the world to plug a particular equipment system. Archer pilots now doing international routes can testify that the old system has not yet produced the results they really need.

During the past six months, there has been an intense aging trend in civil aviation business to get down to hard-headed thinking and action on age problems. We have seen evidence of this in the recent reorganization of the Civil Aeronautics Administration, in the special group created at ICAO's Caracas meeting headed by Dr. Edward Warner and by the technical discussions of IATA.

Economic Revolution Pending

If this spirit and energy continues over the next few years, the advent of jet transports will come in a somewhat operational fashion that will provide better service to the traveling public with lower fares and cut the overhead that has been predicted in some pessimistic reports. In addition to the technical revolution wrought by gas turbine powered transports, there already are signs that an economic revolution is in the making as a result of their capabilities. It was most encouraging to hear Lord Douglas, chairman of IREA and current IATA president call for the more free, energetic approach to the economic problems of the jet transport era that already have displaced by technical gains.

The first subchapters of a yet-see economic revolution came last week with new law. Japan has third class travel proposed by Pan American World Airways for transatlantic routes and the cut rate, extension type fares proposed by TWA World Airlines. The Cannes traffic conference took a step in the right direction, although there will be considerable argument as to whether it was far enough or not enough. There is little doubt now that some 10% fare revision will have to be made in the international rate structure to accommodate the new demands of jet air traffic.

As Lord Goff pointed out, there must be a policy for the transport transport in the jet age has structure to allow both the operators and the travelling public to take full advantage of its lower operating costs. "Thus in areas where I think the transport comes back into the picture again," he told the IATA Edinburgh meeting. "I think it is probable that to practice this kind of discipline will offer a level of operating costs significantly lower than those of pure jets. If this trend proved to be the case, it might mean that the airlines would have to be restructured by the day of airfare. If it would work, it would be the day of airfare. IATA, not only to the airlines but to the public, would have to consider the the landing public the advantages of a low cost airport which introduction of the pure jet airlines possible, but also to give the public a choice of slower service at lower fares. This can come because the most important, not difficult one IATA has ever had to tackle."

As long as LATA can be as forthright and courageous in facing future wants as the strongholds of the health-care industry are today, we think the traveling public can look forward to getting better service at lower prices in the not too distant future.

—Robert H. Hines



hytrol

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Washington Roundup

Less Money for Small Business

Senate Small Business Committee is protecting the downward trend in the portion of military contracts being awarded small firms. A staff report of the committee notes that during the first nine months of fiscal 1956, only 12.6% of the total dollar value of defense business was awarded to small business as compared with 21.5% during fiscal 1955.

In its periodic report, the Department of Defense reported some of the reasons why the full potential of small business contractors are not going to small business. The Air Force, for example, reported that during a nine-month fiscal 1955 period, 42.4% of the full potential of small business contracts did not go to small firms because—the small firms did not bid for the contracts, the bids were not low bids, they did not meet specification.

Men Contacts Men

Men's first radio contact with Men was reported last week. The same Naval Research Laboratory team that pulled up radio isolation from Venus earlier this year detected signals from Men at 7 am, with a 600 m radio telescope. More than 50 measurements were necessary to establish the contents of the contact. Further attempts to detect the and about 1,000 m, was frustrated by clouds weather. First reception of planetary radio contact was to be reported next week in Chicago. Investigations of Washington scientists at nearby Maryland installation. In the summer of 1954, they pulled up radio isolation, state like signals from Jupiter that were millions of times stronger than thermal isolation from Jupiter should be. They are still overclouded.

The Naval Research Laboratory also made news last week by achieving the first controlled release of atomic energy in the Washington area. The Army has had a successfully power and heat plant under construction in Ft. Belvoir, Va., for two years and another type has just been authorized for the University of Maryland, but the Navy's "miniature power" machine already is undergoing exhibition and checkout.

Political Notes

Most of the key figures on aviation affairs at the House of Representatives will return with the new Congress next year.

• **Rep. Clarence Cannon** (D-Mo.), chairman of the Appropriations Committee, has no opposition. Vocal critic of Defense Secretary Charles Wilson during the last session, Cannon is a strong supporter of strategic air power and is vocal, but has been replaced by opposition to his air power views.

• **Rep. George Mahon** (D-Tex.), chairman of the Appropriations Subcommittee on the Armed Services, also is without opposition. During recent years, he has kept a scheduled list of military procurement projects, and directed staff on outlays.

• **Rep. John Taber** (R-N.Y.), ranking Republican member of the Appropriations Committee, has only taken Democratic opposition to his traditionally Republican district. Budget cutting, defense and otherwise, is his main approach.

• **Rep. Carl Vanden** (D-Cal.), chairman of the Armed Services Committee and a leader in defense policies during his 16 years in the House, is without opposition.

So is **Rep. Edward Helms** (D-La.), chairman of the Armed Services Investigating Subcommittee, which made a comprehensive study of procurement and profit policies of military, aerospace contracts.

• **Rep. Henry Smith** (R-Mo.), ranking Republican member of the Armed Services Committee, has no serious opposition from Charles McNair, 35, former radio and television station manager. Smith, however, plans an active campaign and is expected to win. **Rep. William Ross** (R-Ga.), ranking Republican on the Armed Services Investigating Subcommittee, has a stiff challenge from an ex-aviation district.

• **Rep. Percy Priest** (D-Tenn.), chairman of House Commerce Committee, and **Rep. Owen Harris** (D-Ind.), chairman of the Subcommittee on Aviation, have no opposition.

However, outcome of the elections of the three top Republicans of the House, Commerce Committee is uncertain. **Rep. Charles McNair** (R-N.J.), ranking Republican member, is backing a strong and entrenched Democratic state organization. **Rep. Joseph O'Rourke** (R-N.Y.), who is running for reelection and making Republicans on the death of **Rep. Carl Hough**, is a combined vote on a split fight against Democratic former Laborer Harold Zapp.

The outcome of the Sept. 9 race of **Rep. Robert Hale** (R-Me.), final ranking Republican, will seal. The last seat goes Hale's victory by 25 votes.

Airworthiness Review

Civil Aeronautics Board still hopes to have its Airworthiness Review draft rules ready by mid-October. Proposed amendments to the Civil Air Regulations in the draft rules will be based upon discussions held earlier this month at the annual airworthiness review. Industry and government technical experts, including Douglas, have only other sessions, discussed proposed changes in regulations during a working meeting in Washington.

Chief point of interest at the meeting was the CAB's proposed new performance rules for turbine-powered transports. But discussion was extensive and complicated, leading to clarification of language in the proposed Draft Release 16-20. Many things in the recommendations held earlier this month at the annual airworthiness review. CAB's new rules will be based upon discussions held earlier this month at the annual airworthiness review. CAB's new rules will be based upon discussions held earlier this month at the annual airworthiness review. CAB's new rules will be based upon discussions held earlier this month at the annual airworthiness review.

New Money for IDA

Defense Department's Weapons Systems Evaluation Group has requested a \$1.7 million increase with the Institute for Defense Analysis. The new organization formed by a group of universities to perform operations analysis for the Joint Chiefs of Staff and the Assistant Secretary of Defense for Research and Development (AWM 21, p. 25). The contract term through next June.

Trustees of the institute have named Maj. Gen. James McConaugh, Jr. (USMA, att.) as president.

—Washington Staff

but complete and accurate comparisons.

The mission priorities and schedules are intensely sensitive about these work and particularly emphasis its practical aspect. The big treatment this year has been generated by the thought that man's first big step into space is just around the corner. There is much more first engineering prestige riding on the nose of the Vanguard.

—Then in space flight you never see—well, outgoing JAP President Paul Dier. This has been the major theme and greatest excitement of this program.

Navy Orders New A3J From North American

Washington—Navy has awarded North American Aviation, Columbus, Ohio, a contract for 100 A3J fighters to be used in the Vietnam conflict for research and development on a two-place, three jet, high-speed, carrier-based attack aircraft system termed designated A3J. The aircraft probably will be General Electric J79.

The Navy also requested contract for key prototype flight and stability model, and a design and development contract for a detailed evaluation of the aircraft's navigation/handling system, construction of mockups and test cells and control phases of design.

The Navy planned out final design of the "three jet system" for the A3J was a departure from past surface design approach and is being used because of the manufacturer's integration of equipment system.

Fanciel Replaces Bell As Bell Aircraft Head

Buffalo, N. Y.—Lawrence D. Bell, founder of the Bell Aircraft Corp., announced his resignation as president of the firm last week, and his departure to chairman of the board. New president is Leslie P. Fanciel.

Fanciel, 53, served as assistant to the president, aviation section manager, general manager, vice president and director since joining Bell in 1942.

Bell, 67, entered aviation in 1912 as a mechanic. Later, he became vice president and general manager of the Glenn L. Martin Co. of Los Angeles. In 1933 he joined Consolidated Aircraft Co. of Buffalo as vice president and general manager. He rejoined Bell Aircraft in 1935.

In another major move, Captain, vice president and general manager of Bell's Helicopter Division at Fort Worth, was elected a director of the parent company. When reorganization of the Division into a wholly owned subsidiary becomes effective later this year, Gabel is expected to be named president.

Flight Characteristics of B-58 Simulated with Modified F-94

Buffalo, N. Y.—Flight characteristics of Convair's supersonic B-58 bomber have been successfully simulated by General Aircraft's (Labovitz), the Air Force and Convair in a modified F-94 fighter before the first B-58 was built.

Convair is also known to be working on one more unique application of the technique.

The B-58 studies was an integral part of a seven-year research program on stability and control, which has been sponsored largely by the Air Research and Development Command's Wright Air Development Center.

Avoided Costly Changes

Through the use of highly specialized aerodynamic, mechanical and electronic components the F-94 was used to determine performance characteristics of both the proposed control system and the B-58 configuration.

Findings were incorporated into the design, avoiding costly changes in the prototype.

The studies were made by Convair's chief pilot, John C. Goss, Jr. A. Erickson, manager of flight for the Fort Worth, Tex., plant of General Dynamics of General Dynamics Corp. and chief engineering test pilot for the B-58 flight test program, and an Air Force pilot.

The B-58, which recently was rolled out at the Fort Worth plant (AW Sept. 18, p. 34), is now beginning two tests. Convair said the B-58 studies will be the first direct substitutes by the aircraft industry of the laboratory's variable stability technique.

Convair First

Convair first used the technique to modify lateral stability characteristics on an F4U-5. It also has made non-linear aero simulations on an F4U-5 and an F-86D, increased the damping of an F-86D to improve lateral stability, and longitudinal characteristics of the F-94 and a B-26. In 1955, Convair applied these run variable stability to a C-47 transport.

In the F-94 used for the B-58 program, the longitudinal control system was actuated by special hydraulic servo that permitted wide variation of stability and control characteristics. Stability was introduced through automatic movements of the control surfaces independent of the pilot's actions.

Superimposed on the variable stability equipment was a control system for adjusting the stick force to enable the aircraft desired by the pilot for proper control in "feel." Changing control loads in effect varied the design of the test plane.



COMPLEX instrumentation on nose section of Convair's variable stability F-94. Forward instrument section contains data recording equipment and larger section holds the variable stability electronic equipment. Note small window (lower left) attached to table of design.



ROCKET-POWERED X-2 was built at just of USAF's Navy and National Advisory Committee for Aeronautics cooperative effort. Its flight records, plus, and its performance, the X-2 were monitored by Bell Aircraft Corp. in Buffalo, N. Y.

X-2 Sets Altitude Record at 126,000 Ft.

Washington—Acceleration of flight data from successfully controlled flight at altitudes of up to 126,000 ft. has begun at Edwards AFB, Calif.

Each day, the X-2 is flown by pilot Lt. Col. Bruce K. Kiehl. It is known to have reached approximately 126,000 ft., a record for a manned aircraft. Both the USAF and Department of Defense have refused to confirm the record figure.

However, Defense Secretary Charles Wilson advanced this last week that the rocket-powered X-2 had exceeded the previous record of 98,000 ft. established Aug. 20, 1954, by the Bell X-1A in Major Arthur Muroc.

Later in July, the X-2 flew twice by Lt. Col. F. P. Everett established a record around an excess of 1,900 mph (AW Aug. 6, p. 194). The design speed of the X-2 is 1,580 mph.

The altitude record is an excess of the 110,000 ft. which the USAF originally hoped the X-2 research plane would be able to attain.

Proving significance of the flight is the successful control of the X-2 at an altitude of nearly 24 mi. "It was so easy," one report said, "you were not nervous."

In addition the collection of other important high altitude data has begun in earnest.

Unfortunately, later flights were the record run have suffered bad press in the drop from a modified B-58 engine plane.

Although the primary purpose of the

research aircraft is the acceleration of high altitude and high speed flight data—some of which is relevant to the altitude and speed records—the Pentagon under a temporary effort last week to prevent publication of the altitude record. It has never officially confirmed the record.

The effort was directed from a high military level and not from the civilian side, usually held responsible for withholding information. The decision apparently had the backing of the White House.

The news that a week, press and Pentagon public relations officers at

tempted to convince top military officials that the facts were too widely known to be kept secret.

Nevertheless, in the first Secretary Wilson held his press conference the decision had not been changed.

The X-2 is powered by a 15,000-lb thrust, double-barreled General Wright rocket engine.

In its speed run in Feb., the X-2 did not reach its design speed of 2,100 mph, because of heat problems with the turbo-fan pump.

The one week which the X-2 proved its 120,000 ft. target indicates that on this flight there were no deficiencies.



Bell's X-2, powered by 15,000 lb. thrust General Wright double-barreled rocket engine, now holds both altitude and speed records—126,000 ft. and 1,900 mph.

Aussie Air Imports Total \$23 Million

Melbourne, Australia—Austrian air parts of aircraft, aircraft parts and engines covering the fiscal year ended June 30th, totaled \$22,931,969.

Value of aircraft imported, including helicopters, gliders and airplanes, was \$7,747,671. Of this amount, support equipment for the United States was worth \$1,953,254.

Imports of 125 aircraft construction engines including jet, were worth \$5,577,680.

Imports of aircraft parts were worth \$9,661,150. Of these, 60% originated in the United States.

B-47s to Fly Non-Stop From U.S. to Australia

Washington—Three Strategic Air Force B-47s are scheduled to make the first nonstop flight from the U.S. to Australia in November during the third annual Operation Handicap. This also will visit New Zealand.

This will be the first arrival with the Strategic Forces at Melbourne and conclude their flight with an RB-47F Thunderbolt 4th from the Far East Air Force's 67th Tactical Reconnaissance Wing at Itami, Japan, and a C-124 Globemaster and three C-119 Fleetclift from the 115 Air Division at Taniguchi Air Base, Japan. The 15th AF B-47s

will refuel in flight from KC-97 tankers. Handicap routes, the first, has been to the U.S. and Australia and then to Japan. The USAF plans, in spite of the Royal Australian Air Force, will fly over 11 cities in Australia, New Zealand and Indonesia and will be on strike display at four cities in Australia and one in New Zealand.

Irvine Asks Industry For Super Materials

Los Angeles—Lt. Gen. C. B. Irvine, Air Force deputy chief of staff for material, last week called for "dramatic, revolutionary" developments in aircraft materials to prevent the U.S. from losing its qualitative superiority in the air.

"We must come up with something revolutionary, something that changes our entire thinking in regard to the use of materials as an element," Gen. Irvine told a meeting of the American Society for Testing Materials here. "We need to see 'super breakthroughs' in doing this."

Gen. Irvine urged "independent sponsored research and development programs," an exploration of the "traffic possibilities" of plastics and composites, and abandonment of the "out, up and out" in the search for closer and new alloys. He added:

"In just a few years, our material research leaders would have to view the possibility of Mach 30, with turn performance in the area of 15,000°."

USAF B-52s Grounded After California Crash

Wright-Patterson AFB, Ohio—Air Materiel Command last week ordered the grounding of Strategic Air Command's Boeing B-52 "stratofortress" bombers in a "precautionary action," after a Stratofortress caught fire and crashed near Carls, AFB, Missouri, Calif., killing five crew members. The pilot and copilot ejected and escaped with superficial burns.

Despite the grounding, flights were being made daily and crews remained on a standby basis in the event of an emergency. The B-52s were grounded temporarily last Wednesday until a type of aluminum which had caused the crash of another Carls AFB bomber was modified.

The aircraft commander, in last week's crash, Maj. Raymond R. Orfield, 407 Combat Group, Inland Squadron, and copilot, Capt. William J. Vetter, 91st Bombardment Wing, and they were returning to Carls on a training flight when their compartment filled with fumes.

Maj. Orfield opened the escape hatch and he killed the compartment burning by hand and neck. He got orders for the crew to leave the aircraft, and he and Capt. Vetter ejected. He said he bailed back as he parachuted down and saw the B-52 enveloped in flame. It exploded on impact, destroying a firm base.



ROUTE of globe-circling KC-97 tanker, planned by SAC which will orbit a course six months, ending to determine the shape of the earth's magnetic field. Plans will cover stations from ARCC's Cambridge Research Center on 10,000 mi. journey.

Air Force to Map Earth's Magnetic Field

By Everett Clark

Bedford, Mass.—An Arctic stratosphere test week began an ambitious three-month, 50,000-mile flight to map the earth's magnetic field more accurately.

A KC-97 Stratofortress carrying a \$150,000 science jet meter took off from 1. G. Henson Field here on a flight that will sample 900 recorded miles in other parts of the earth's equatorial magnetic zone on releases at a constant altitude of about 15,000 ft.

The project, called "The Glean," is sponsored by Air Research and Development Command through its Cambridge Research Center here, the Strategic Air Command and the University of Chicago.

Studies by Dr. John A. Simpson, physics professor and Peter Meyer, assistant professor of physics, at Chicago University's Enrico Fermi Institute for Nuclear Studies, have indicated that

the pattern of the magnetic field for earth in space is not the same as it is at the earth's surface. The effect of the earth field on incoming cosmic radiation should give a fairly accurate indication of the pattern.

Dr. Simpson and Mr. Meyer developed the measuring techniques being used and proposed the flight. Essentially, the science jet meter is a new type jet adapted to measure radiation and pressure locally produced by ionizing radiation.

Project scientist is Ludwig Katz, head of the Cosmographic Section of Cambridge's Cosmographic Research Department. He will do most of his timing of a SAC C-124 Globemaster which is leading the way of the KC-97, carrying equipment, supplies and an extra crew for the KC-97.

John F. Butler, an electronics scientist in the Cosmographic Section, will make most of the flights in the KC-97. He recently spent three weeks flying in an RB-47 equipped with the same science jet meter, taking stratospheric readings over the United States. The mission is similar to a network of ionizing devices which the Fermi Institute has established throughout North and South America. It was recently adapted for in-flight use.

The scientists hope to locate the great magnetic equator precisely and determine its relationship to the geomagnetic equator. In addition to increasing an understanding of the earth's magnetic field, the flight should produce information helpful in planning satellite launches and other plans for the International Geophysical Year.



Hypersonic Rocket

Wright Air Development Center's Hypersonic Test Vehicle (HIV) speed plane and rocket is to be fired from 15-ft launchers. Test vehicle (left) plane while in flight. Rocket was developed by USAF and Ames Research Development Corp. A Cruise-Mach 10 rocket. Fifteen experimental models have been fired and tested at Holloman Air Development Center, and design is moving toward production. HIV is two-stage, ten-foot long, fired from portable launchers. It reaches 5,000 mph within two seconds of launching.

U-2 Crash

A Lockheed U-2 high-altitude research plane reported by the National Advisory Committee for Aeronautics crashed last Sunday last week near Koenigsberg, Germany, killing its aviation pilot, Howard Gary, at Aachen, Ind.

Gary, 48, was a Lockheed employee on loan to the NACA, which is using the volcano U-2 to collect data in the U.S. and abroad concerning cosmic rays and the ionosphere of elements that appear in the atmosphere, including ozone and water vapor (ENR 10 p. 15).

The U-2, powered by a Pratt & Whitney J57 turbojet, also is probably being used to probe atomic fallout.

India Orders 25 Folland Gnats

London—Indian government has placed an \$5.4 million order for six aircraft, ordered by 21 Folland Gnat light-weight, two-seater fighters, landing a battleship that threatened to relegate the design to obscurity, barely beyond official indifference and red tape.

The Indian order had been hanging fire all summer since an initial agreement between the government and Folland was reached on the Gnat order. The Indians finally to sign a firm contract, led to considerable speculation that Russian efforts to provide MIG fighters had disappointed the Gnat deal.

The Gnat contract signed by Mrs. V. P. Pandey, Indian High Commissioner, calls for an initial production of 25 Gnats, with rights to continue production in India under license.

In addition to the Indian order, Fol-

land has a contract from the British Ministry of Supply for six Gnats of which the first is to be completed, and is placing great hopes on a new transonic trainer development of the Gnat design by a firm Royal Air Force order (AW Sept. 17, p. 21).

Several other foreign countries are extremely interested in the Gnat but have held off commitments until the jet was broken with an initial order large enough to ensure a reasonable price for follow-on production.

Meanwhile, a representative mission in London says the Russians have offered the Indians the Budget two-seater medium bomber in a follow-through also can page on the basis of the British air campaign pushed into India by the Russians since the Bulgarian Khreshchev sent.



CESNA 620 BUSINESSLINE twin and its island from McComb AFB, Wichita. Plane has about 20 hr. flight time.

Cessna Unveils Model 620 Transport

By Erwin J. Nelson



NEW INSTRUMENT CONCEPT is designed for optimum read time, with difficult-to-read dials. Radio, navigation controls are on right of approach plate, flight dials to the left in front of wheel. Each engine can be completely secured by flipping one lever (top).

Wichita-Cessna Aircraft Co. will begin producing its new four-engine powered 250-hp Model 620 business plane early in 1964. Deliveries will begin late in 1963 at a price of \$575,000. The company recently opened its sales campaign to the 9 to 15 passenger executive transport with an open house last December and Friday attended by numerous executives and pilots who watched the airplane fly and were shown mockup of a glass cabin.

Marketing Manager Frank Morley gave the guests new performance figures on the Model 620 that were substantially improved over earlier figures and released by the company.

- Top speed of 282 mph at 15,000 ft.
- Maximum cruise speed of 250 mph at 2,000 rpm at 15,000 ft.
- Takeoff over a 50-ft obstacle at 15,000 lb gross weight at sea level with max cargo out at V_{LO} rises 1,700 ft.
- Landing distance at landing gross weight of 14,265 lb over a 50 ft obstacle at sea level is 1,070 ft.
- Maximum rate of climb is 15,000 ft at sea level at 2,250 rpm at 15,000 ft the 620 will climb 1,110 fpm.
- Maximum range at 75,000 ft, at optimum power is 1,700 mi. endurance at 5750 power is one hour. Fuel capacity is 555 gal.
- Powerplant operational ceiling is 15,000 ft on three engines and at 14,300 ft, the engine has a service ceiling of 20,000 ft.

Figures Are 'Conservative'

The 620 weighs 10,000 lb empty, this includes provision for 275 lb of electrical equipment.

Performance figures are given by Cessna as "conservative," but sources close

to the manufacturer say that they are on the conservative side. The company will hold up no definite data until flight tests are completed and then provide guaranteed figures.

Powerplants are four Continental GR6750-A six-cylinder horizontally opposed reciprocating and ground reducing type with exhaust supercharger rated at 350 hp each sea level at 2,200 rpm at sea level with maximum continuous rating of 310 hp. Critical altitude for ME70 power is 15,000 ft at 1,800 rpm. This blade counter-rotating loading blade propeller of 55 in diameter is fitted. Retractable push floats are offered as optional equipment.

The \$475,000 price includes a stand and interior of the design type seats and a folding table. Cessna will provide linen with a catalog of interior furnishings.

Crewmen will be trained for stand and floor seat use.

Wing features custom and built, which are of the Goodrich fast-track high pressure pressure type, and piston engines are extra. Optional equipment includes heated brakes, mechanical power steering, a Collins winged flight vision and a transponder.

Typical Concept

The Model 620 falls into the parade of what Cessna describes as its "general concept" of the corporate airplane market. At the base bottom of the ground lies the deep base of tens of thousands of single-engine light planes at the next level are thousands of light twins. At the top of this narrowing pyramid is a smaller fleet of heavy twins beginning with the Beech 15 and D11 D12 through the Lockheed, DC-3, Con-



AIRSTAR DOOR leading into six foot high cabin will have retractable steps to save space.



FLAT CONTINENTAL ENGINES are especially designed to allow easy check of accessories.



HOSE AND MAIN LANDING GEARS (left and center) are designed and built by Cessna. They have Goodrich 125 psi tires derived to 67,700 psi. Antiskid brakes are optional, as is power nose wheel steering. Flaring (right) attracts when winds door is closed.



and liner seal as well as some DC-6. Until now, Cores has been broadly represented in the lower layers of the pyramid, and the A10 represents its efforts to cover the entire business plane. EMI is entering the top echelon of America's global jet aircraft.

Series close to the company are first at roll-off the Model 610 in the within service for use as an official transport and in a multi-engine version for inspection, order and maintenance crewmen. Several foreign airlines have indicated interest in combination gas engine/turbine versions for freightline operations.

The Model 610's specially designed Aukowich gas turbine will provide crew and passenger and baggage and mail main compartment with the equivalent of 8,000 lb. thrust when the airplane is at 15,000 ft. The engine will completely air condition the airplane in the ground or in the air, produce a source of electrical power to make the A10 independent of external power sources by doing a D.C. generator. The airplane has 24 V, 50 amp generator on each engine and on the turbine.

News Digest

Lockheed Aircraft Corp. received a \$20 million order for production of T-33 jet trainers on a fixed price contract. The order represented the largest single T-33 purchase in the past three years. It will bring the total number of T-33s to some 5,000, will extend production of the trainer into mid 1958.

New ordered approximately \$200 million more of Canada. Mustang II and Canadian-built Ford 1957 trucks. Purchased by Pratt & Whitney JET turboprop, Canadian has been in quantity production since September 1955.

Martin Co. will build a new plant, presumably for missile research and development, on a 10-acre site recently purchased in the vicinity of Patrick AFB, Texas. New York Test Center near Orlando Fla. Martin aircraft is scheduled to test and launch the multi-stage Vanguard satellite missile from Patrick. Its Winston-Salem missile also was tested out at the center.

New million dollar contract for aircraft of Lockheed T-33s and F-80 jet aircraft was awarded Aircraft Engineering & Maintenance Co. by USAF AFMCO, subcontract of Transcon Corp. of Colorado, concerned engine-propulsion engine docking use of plant in Oakland.

General Aviation Facilities Planning

Company received management consulting firm of Boston, Ohio and Hamilton to determine feasibility requirements of General Aviation during next 20 years. Study will involve analysis of volume scope of 70,000 general aviation aircraft in U.S.

Aeromarine Broadcasting Equipment Theobald, Inc., and Western Union Telegraph Co. purchased 50% interest in Wind Tunnel Instrument Co. Inc., of Norwood, Mass. Each of two companies will receive 15,000 shares of Wind Tunnel stock, under terms of financial plan that involves a total of \$400,000.

Conversion of Fair East Air Force to North American F-100 Super Sabres will begin in November when the first flight arrives for Fifth Air Force's 30th Light Bomber Squadron at Iwakura, Japan. The F-100s will be the last conventional series fighters to reach the Fair East air strength.

Ryan Aircraft Co. closed \$17,023,641 for new aircraft in mid-July 51. Net profit of company after taxes—\$41,989, equal to \$2.44 per share.

Grumman Sea Veeer fighters of Australian aircraft carrier Melbourne resumed flying exercises off New South Wales Coast, still under close watch regarding performance and safety.

Hunting Associates received Jet Powerjet in Canada for demonstration with the ICAI after successful evaluation trials with the RAF.

United Aircraft Products, Inc., of Dayton received first in a series of contracts which will total approximately

\$5 million for its designing cold weather oil system and hot fuel preheating system for the Boeing KC-97.

Heaton Aerial Services of Pasadena, Calif., and the Fortinet Air Force Mapping Agency signed an agreement providing contractual facilities for Position companies covering various aerial photographic and mapping surveys in that country.

RC-119 follow-on orders have gone to Ryan Aircraft Co. for 512 and low worth of freight services and to Lorr Inc., Grand Rapids (Michigan) for automatic flight control system to cost \$1,902,641. Ryan also has 757 air base freight services contract from Boeing.

De Mark Engineering Co., Glendale, Calif., has been selected to manufacture and sell spare parts for Douglas B-26 aircraft. De Mark operations in adapting B-26 bombers for civilian use.

Transcon Corp., of Colorado, holding company for a group of enterprises known as Transcon Air Lines with a reorganization under the new reports a net profit of \$443,307 after taxes for the fiscal year ended May 31, 1956 with a gross revenue of \$22,776,735 for the period, highest in the company's 10-year history. Transcon's earnings amounted to \$1.08 a share.

Continental Air Lines will need August passenger revenues at \$1.5 million, derived a dividend of \$24 cents a share payable Sept. 30. The August air cargo revenue is \$4.6 million, but that for August 1955, and hoped Continental's gross was roughly half of \$1,328,000 in October 1955.



Whirlwind Landing

Booth Whirlwind equipped with portable wheels in response to landing during emergency landings of Cessna. Informed to a maximum landing pressure of 12 lb./sq. in., pressure will withstand a test pressure of 32 lb./sq. in. A steel shell about 11 in. in diameter is fitted into hole of each position to provide protection for tires from landing.

a New 400 CYCLE MOTOR

with integral gear box
for use in missiles and
jet aircraft



**SPECIFICATIONS OF EEMCO
TYPE 400 MOTOR**

EEMCO Type 400 is a compact, light weight 400 cycle, 3 phase motor with an integral gear box. It operates on 330 volt power. It was designed by EEMCO especially for use in aerospace aircraft and missiles and meets MIL-M-7300 (ASG) specifications. Weighing only 13.25 pounds, it has a continuous output of 2.75 HP at 1140 RPM at the gear box. The power factor is 83% while the overall efficiency at the end is 76%. Mounting flange is made to Spec. AEC-20,000.

A feature in the design of EEMCO Type 400 is that the gear box acts as the motor support which places the load at approximately the center of gravity of the motor pump assembly. This makes the unit self-aligning. No rubber mounts and vibration isolators are required. Mounting flange and mounting flange are made to Spec. AEC-20,000.

Type 400 is another example of the fine craftsmanship found in all EEMCO products. EEMCO's entire effort is confined to the design and production of minor and rotary actuators and special relays of high speed light weight units. Many of the best in the world and missiles being developed or delivered only by EEMCO units. EEMCO products are also used for industrial applications where precise control mechanisms are required.

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AIR TRANSPORT

Collins 'Radar Cocoon' to Protect Aircraft

By Philip J. Klaus

Development of a self-contained airborne proximity warning system, which is able to detect and protect radar cocoons around an airplane as it moves through the sky, will be the first phase of a two-part Collins Radio Co. program aimed at fully automatic air-to-air collision avoidance.

Collins expects to begin flight tests on a prototype proximity warning system (Phase I) in January 1955, and hopes to start production by September of that year.

If another airplane penetrates this radar cocoon, the proximity warning system will flash a warning to the pilot of its equipped airplane and a panel indicator will show the approximate bearing and distance to the intruding aircraft. During VFR weather, the pilot can then look for the intruder, decide whether to proceed a collision threat, and if it does, the proximity warning system will flash a warning to the pilot to avoid the threat.

In the second phase of the program, Collins will develop a collision avoidance computer which when added to the proximity warning system, will automatically determine whether the intruding aircraft represents a collision threat. If it does, the computer will indicate which direction the pilot must turn to avoid the threat.

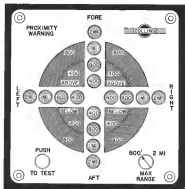
How It Works

Design of a compact to detect intruders within a collision threat zone is considerably more complex than the proximity warning task. Research and analytical studies into collision avoidance dynamics will be carried out in Collins' computer, with the final speed and design of the proximity warning system. Based on research findings, Collins hopes to have a final computer available by November 1955.

Designing systems for the proximity warning system outlined by the airline and business aircraft operators, the system will use the Collins' radar system to detect intruders within 100 miles. The Collins' radar system is a two-part system, consisting of a 51.5 MHz radar system to detect intruders within 100 miles and a 100 MHz radar system to detect intruders within 100 miles.

The proximity warning system is expected to weigh about 75 lb and occupy a one ATR size enclosure of an instrument panel indicator.

Head of the Collins system is a



COLLINS' airborne proximity warning system indicates direction of intruding aircraft and relative location at various altitudes. The shaped sectors light up to show presence of aircraft directly above or below own airplane.

quency modulated (FM) continuous wave (CW) signal (1000 mc) radar Collins' radar FSI-CV is produced to pulse the radar because of its ability to operate at extremely short range.

The CV's output is frequency modulated at 400 cps in accordance with the aircraft's 400 mc ac power supply.

Six existing fixed beam radar units will be converted to provide the following radar beams around the aircraft:

- Upper hemisphere, capable of detecting the presence of an airplane within 100 miles but not reflected to aircraft passing 1000 ft above.
- Lower hemisphere, providing a radar beam of detection below the aircraft.
- Line-of-sight, providing full dog coverage at altitude 75 deg above and below one-plane altitude and extending out to a range of two miles in high density terminal area, pilot can reduce this line-of-flight search coverage to an 800 ft range to prevent search line clutter.
- If possible the five fixed beams for generating upper hemisphere and lower hemisphere coverage will be mounted along the vertical stabilizer for optimum radar vision.

Continuously Escorted

The four line-of-flight antenna beams will be arranged so that each covers a different 90 deg azimuth quadrant (on sketch p. 58). Each beam will be triggered and converted to a radar receiver for each second, following which the next quadrant will be engaged. The full 360 deg azimuth area will thus be covered every two seconds.

The two hemisphere beam antennas have will be continuously scanned and monitored by two independent radar receivers.

A radar echo from an intruding aircraft will serve to detect its presence. The phase shift between the radar and



SR William F. Heflin, Director General of IATA, Jim T. Topp, president of TWA and visiting IATA president, and Lord Douglas, IATA chairman and new IATA president.

airlet position reporting procedures

- Basic development of internationally accepted and compatible means of standard radio
- Reduced longitudinal separation minima and position reporting in areas where navigation facilities are not available
- Regulation of all aircraft movements by air traffic control system at all times in congested areas
- Airport obstacle lights on all runways
- Strict rules that no aircraft be permitted to fly closer than 500 ft to another for military identification or any other purpose
- Development of altimeters that can provide accurate measurements at high altitudes
- Make a detailed study of weather, navigation and landing patterns for current equipment applicable to jets

The technical committee also called for a basic reorganization of traffic control methods to be used either by a single, basic and one control for transoceanic flight boundaries for civil aviation. Such boundaries, it said, have been made unrealistic by present aircraft speeds.

Looking to future traffic control system requirements, the committee noted that "the increasing speed and density of traffic will require a spectacular increase in the speed of our communications and in the increasing measures of discipline on the part of pilots and agencies." The committee warned that the increase in North Atlantic traffic is posing serious control problems by the increasing of available capacity. "No matter how much capacity can be expected until saturation and of greater range plus reliability are desired and installed or until present air to ground and point-to-point communications are improved."

Before this we cannot anticipate any significant reduction in the large protective bands of airspace around each transoceanic aircraft. We must there-

fore rely on other measures such as improving existing facilities, streamlining procedures and exploiting all known communications techniques."

- Other committee report subjects
- Single reduced high frequency communication technique not recommended as an international standard to fit the growing volume of air-to-ground radio traffic from the limited frequency spectrum available
- New system of runway lights for instrument landing systems not recommended by IATA to the International Civil Aviation Organization. This runway light configuration uses automatic range double bands of flash lights from the runway threshold extending 1,000 ft down the centerline at 75 ft intervals. Supplementing these lights down

the centerline of the runway are beacons, double row elevated lights running the length of runway in the same position as runway lights now occupy.

• Runways required for jet transport operations will not pose a serious construction problem as anticipated earlier. The committee noted that, even the present status pattern, jet transport will take off at full gross weight from only a few airports internationally and will not. Most airports will not require special new runways for jet operations. Rather than lengthening existing runways as anticipated for jet operations, the committee recommended the construction of stepways—cleared areas beyond the end of the runway where jet transport can be stopped after shorted takeoffs. These will require much less expensive construction than new runways.

Runways and two-stage ways weight capacities are satisfactory for present heavy aircraft. It will be able to handle jets because of the load distribution of jet aircraft. Jet aircraft loading, gear and distribution, noise and loading characteristics, the committee noted.

- New inspection techniques will be required to replace or to reduce present the way. Jet aircraft loading, gear and distribution, noise and loading characteristics, the committee noted.
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Fare Adjustment Necessary

Dillingham is a member since the 12th annual general meeting of the International Air Transport Association that have changes in the international airline fare structure as a necessary preliminary to the successful opening of the jet air transport age.

Because of the emergency in the American fare structure with its absolute maximum fare which often causes re-flight by air transport.

K. C. Gervelle, international director of British Overseas Airways Corp., who pointed out B.O.A.C. fares, traffic conference last June, said that the American fare structure is a disadvantage in the Middle East and will soon be corrected to the North Atlantic.

Gervelle would that every problem needed to be the Council conference will become aware by the time the conference meets again next September. He said:

"Unless we are able to find solutions to these problems, we may find ourselves in overhauling the task of our rate efforts that, though we have the right tools and some valuable new system from the passengers."

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Reduction Planned In Reserve Air Fleet

Washington—The number of aircraft allocated to the Civil Reserve Air Fleet will be reduced during 1958 to 19,600, according to Thomas Harrison, Jr., a member of the Defense Air Transportation Administration.

The revised allocation, based upon recommendations from the Industry-Defense Advisory Committee, will be 151 four-engine transports in 1959 as compared with 168 in April 1958. The aircraft are scheduled for assignment to the Military Air Transport Service upon 48-hour notice in the event of a national emergency.

Aircraft participating in the 1958 CRAF program represent 38% of the active fleet participating in the program.

The 1959 CRAF will represent 52% of the commercial fleet for that period. However, because of increased load capacity of the same modern aircraft, it is estimated that total CRAF will be around 100,000 aircraft by the year 1960.

In addition to the 1959 fleet, 35 aircraft were designated as transport reserves to replace lost aircraft.

Hughes Hopes to Lend \$10 Million to TWA

Washington—Hughes Tool Co. plans to provide Trans World Airlines with \$10 million in standby credit has been submitted to the Civil Aeronautics Board for approval.

TWA is asking the Board to approve the agreement under which Hughes would make \$10 million available to the airline. TWA could borrow against the credit until April 30, 1958.

CAB approval is necessary under the terms of the 1946-1948 order approving the acquisition of control of TWA by Hughes. When it approved the Hughes-TWA contract the CAB required compensation between the two companies to \$300 each and a total of \$10,000 a year.

Now, for the second time this year, TWA and Hughes are asking the Board to approve a major expansion to the order. Last May, the company requested approval of a deal in which Hughes would lend jet transports and all 25 of them to TWA (AW May 23, p. 41).

The CAB scheduled a hearing on the jet transport proposal, but Hughes later asked that it be postponed. No further action has been taken on the plan.

The new credit proposal would allow TWA to borrow up to \$10 million from Hughes on reserve credit. But money would be in multiples of \$100,

000, and the loans would bear interest at the prevailing rate for six-month loans in New York.

The annual amount of the credit would be \$60 million. It would be reduced to a \$7.5 million maximum on Nov. 1, 1957, to \$5 million on Nov. 1, 1957, and to \$1.5 million on Feb. 1, 1958.

Dallas Case Limited To California Routes

Washington—Civil Aeronautics Board has denied a northern transcontinental route that operated along and between the Dallas-Fort Worth-Casa studies to routes between Dallas and California.

The decision to limit the case was made on a split vote with CAB members Joseph P. Adams and C. Joseph Moberly voting against the case to permit out of Dallas.

The Dallas-West Coast Case arose about when the City of Dallas complained to the CAB about the absence of trunkline service to the West Coast. American Airlines has a monopoly on the route.

While the case was pending, several airlines filed applications which would have expanded it into a southern transcontinental case and would have included service to the Pacific Northwest and north coast service along the West Coast.

In its consolidation order, the Board decided to limit the case strictly to

proposals for new routes between Dallas and California to permit in New Mexico, Arizona and Nevada.

The order left a loophole in saying that the airlines would have a chance to establish on the route that operating as a protection to the limited route would "as a matter of course be" possible granting of one of the excluded applications. If the carriers filed accepted applications could point this, the Board would have to expand the case.

The CAB says that the on the Dallas-West Coast Case, the Dallas-California service a second and third expansion of the case would still study the case.

The Board decided to exclude local service route applications from the case and voted to require a membership vote at Dallas in an effort to limit the cost of such operations to the case. CAB members in the case. Air Rights voting California points also would have to serve Dallas.

Airlines with applications included in the case are: Boeing Airline, Continental Air Lines, Delta Air Lines, Western Air Lines, American Airlines, California Western Airlines, Eastern Air Lines, National Airlines and Trans World Airlines.

Designing with light against by the majority. CAB Vice Chairman Adams said the case should include Houston and New Orleans as centers toward points. Martin Harris argued the Board should not include southern routes case.

Report Favors Transport Census

Washington—Commerce Department study group has found that the inadequate census of transportation is needed to fill serious gaps in generally reliable transportation statistics.

Reporting to the Secretary of Commerce, Louis S. Rothchild, Under Secretary of Commerce for Transportation, recommended that the Bureau of Census conduct a comprehensive survey of a 512 million transport census to be conducted in 1958.

Rothchild's staff found that even inadequate transportation statistics are needed to be conducted at the current rate, as well as to the administrative and legislative processes of the government, and the group found serious gaps in presently available data.

To fill these statistical gaps, Rothchild recommended a 1958 program consisting of three surveys:

- Community distributions by land and water
- Passenger travel by land air and water
- Freight transportation inventory and utilization

- The transportation inventory and utilization
- An cargo commodity movement
- Experimental surveys to develop methods and techniques for handling major surveys

The census are designed to supply information in the transportation is needed on contained in the census statistics are published in the government. This will increase the value of the census statistics and the markets and market channels in which they operate.

A census of transportation was first ordered by Congress in 1948 to be conducted in 1949 and 1950 but was thereafter, but no funds were appropriated in 1949 or in 1951. The census was not through a series of studies and was finally assigned to the Under Secretary of Commerce for review in April 1954.

The last study is now complete, and Rothchild has recommended that the Bureau of the Census make further attempts to secure funds for a transportation survey.

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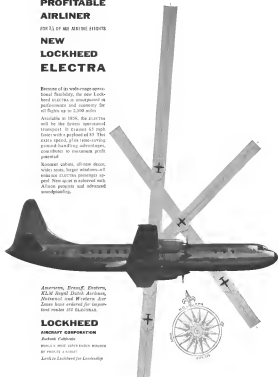
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CAB Reports on TWA, Riddle, Northeast, West Coast Accidents

By Gary Lewis

Washington—The Civil Aeronautics Board has issued reports on accidents involving aircraft of Trans World Airlines, Riddle Airlines, Northeast Airlines and West Coast Airlines.

The TWA and Riddle accidents were fatal crashes in which both aircraft were destroyed. West Coast and Northeast's accident involved only minor injuries to passengers and crew.

TWA's accident occurred at Pittsburgh last April when a Martin 40-4 crashed and burned immediately after takeoff. The standard and 71 of the 31 passengers were killed, but both pilots survived.

Immediately after takeoff the pilot saw the left engine Zone 1 fire warning light come on, and he cut the left throttle to the point where auto-throttling was disallowed.

He then climbed for the left main-lift-off horizon, but the engine thinking that auto-throttling was still operative disallowed the pilot from pushing the manual feathering button and tried to get auto-throttling to pull any back, the left engine to the cut-off.

The captain saw a TWA fire check captain who was checking the pilot, a first officer, for engine.

The CAB found that this sequence of actions led to a crash with engine on, procedures prescribed by the company for propeller fire or failure. The investigation showed that the warning was caused by failure of an exhaust connector clamp which fire good a fire detecting unit.

The procedures followed by the two pilots resulted in a wing-fuel left propeller which, along with extended landing gear and tilted flap, produced enough drag to make the airplane lose altitude and crash.

The CAB said the cause of the crash was "uncoordinated engine action in the very short time available to the crew, which produced an airplane configuration with unmanageable drag."

Riddle

The Riddle transport, a C-46, crashed in a cornfield near Hollywood, S. C. last December while on a scheduled cargo flight from New York to Miami. Both pilots were killed.

The CAB investigation determined that the C-46 disintegrated before it hit the ground, with the right outer wing hit the ground and the left engine nacelle separating from the aircraft in flight. Downward failure of the right

wing was the first in the sequence of structural failures.

The CAB report said numerous non-combinations were found in the elevator controls making the airplane inoperative for aerodynamic certification. The Board said both the Civil Aeronautics Administration and the airline should have detected the parts which did not conform with regulations.

The Board found that erratic action of nonconforming elevator control tubes caused the C-46 to pitch down a steep climb to cause the right wing fall.

West Coast

The CAB found that a West Coast Airlines DC-3 crashed at Pullman, Minnesota. Despite last flightman because the pilot abandoned his approach too late to avoid a hill near the runway.

The accident occurred during an approach to the Pullman, Minn., airport on Feb. 26 at about 7:40 PM. As the pilot began to execute a missed approach, the DC-3 hit a hill about 500 feet from the runway.

The CAB found that the first eight lamps on the right row of runway lights were inoperative and that the three green threshold lights were not all fully operative. These conditions contributed to the crash.

The CAB blamed the accident on inadequate maintenance of runway lights and incorrect reporting of this condition by the report management. Air line captain was criticized for incorrect reporting of lighting conditions.



Business Aircraft Radar

Smallest, lightest airborne electronic radar for commercial working units. 50 pounds in weight. Developed by Radar Co. of America. Nine inches, which weighs about 40 lbs. in such a small radar has 50 m. range compared to 100 m. for other radars. Several other companies, including Collins Radio, reportedly are developing lightweight weather radar.

super lights were righted again. When the lights were shown for a second time, the pilot started a missed approach procedure, but before the airplane started to climb, it hit a hill about 40 ft. from the crest. The CAB said the missing altitude of the DC-3 reduced the factor of safety substantially.

The Board said the cause of the accident was "the combination of a landing approach following loss of visual reference to the airport and the delayed attempt to execute a missed approach."

Northeast

Last March a Northeast Airlines Cessna 240 landed in deep snow to the left of a runway at Portland, Me., airport. The accident occurred on Feb. 15, 1953, when the airplane, five of the 15 passengers suffered injuries.

A row of airport boundary lights running parallel to the left row of runway lights created the illusion with the runway on the runway was to the left of the actual position. Landing at night in light snow and with limited visibility, the pilot set the Cessna down in deep snow to the left of the runway.

The CAB report found that the first eight lamps on the right row of runway lights were inoperative and that the three green threshold lights were not all fully operative. These conditions contributed to the crash.

The CAB blamed the accident on inadequate maintenance of runway lights and incorrect reporting of this condition by the report management. Air line captain was criticized for incorrect reporting of lighting conditions.

New Argentine Airline To Operate Abroad

Buenos Aires—A new Argentine airline has been formed with private capital for foreign and domestic flights.

The Buenos Aires-New York flight will be the first of the country's new airlines, which included Aerolineas Argentinas' monopole on inter-Argentine flights and opened the way for such first companies controlled by Argentine nationals.

The new firm Transatlantica S. A. starts activities with capital of \$2.2 million. The firm will begin operations Buenos Aires-New York flight in May of next year, and plans in 1955 to inaugurate service to San Francisco, with connections to the Far East.

Super-Constellation (104000) will make the international flights. The plane, the first of its kind in the world, is to be used in a bare fuselage system, from California East coast to Mexico, with the help of the Rock of America. Purchase price was \$2 million dollars.



From Tokyo to Thule the Air Force meets the Solar Serviceman

GAS TURBINE ENGINES are gaining ever a wider use in military service... the turboprop gas turbine (turboprop), gas turbine engines and many other applications. Solar Field Servicemen constantly visit Air Force bases and Armed Service evaluation centers establishing training programs and checking installations. Solar Field Servicemen use a vital part of the time that has produced the trouble-free record of Solar gas turbines.

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C-122C, Douglas C-24C, Convair C-130B and the Boeing KC-97 tanker. The Jupiter is being produced as a conventional and available and constant speed version for other applications.

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ATA Official Pushes Program For Blanket Air Traffic Control

By Katherine Jakobs

Washington—Milton Arnold, vice president of the Air Transport Association, has urged that planning and research be launched immediately on a nation that would blanket the continental air space with positive traffic control.

In testimony before the House Commerce Subcommittee on Aviation headed by Rep. Carl Albert (D Ark.), Arnold termed the present three-year federal aviation plan "unrealistic for the Civil Aeronautics Administration as 'only the initial step'."

Under the present plan, positive control would be provided to more than 15,000 ft.

"It is the strong feeling of the airlines," he said, "that a system of two pilots per traffic control must be developed to provide separation and expansion of all traffic operations of a certain minimum, except in certain specific areas, primarily in low altitudes, where the nature and density of traffic does not require such strong handling. It will not cause much greater and spreads from those who feel that they are being kept out of so-called freedom of the skies."

He anticipated, however, that the system can be applied "without exposing to undue hardship or private flying."

No Area Exempted

But he and other members of the subcommittee have gone a step further than Arnold with the suggestion that no areas be exempted from the controlled system.

Other developments of the hearings included:

• **Learn Rothchild.** Under Secretary of Commerce for Transportation disclosed that the administration will recommend a plan within the next future for securing routes to insure federal aviation development.

• **Arnold reported** that the Association of Airline Pilots and Service Officer groups are working on cockpit configurations designed to increase the size of pilot visibility.

• **American Telephone and Telegraph Co.** has agreed to locate its Yatai jet units to help increase production of V-type units for the common usage two system. V-type units. Rothchild told the subcommittee will cost between \$1,000 and \$5,000 each.

Always Charges

The two law cases on aviation over charges have not yet been resolved, Rothchild said. "Where are

• Whether men should be required to ensure the regulations not as with the experience one.

• What the yardstick for charges should be—fuel consumed, landings, and so on.

He noted that the military services account for over 50% of the cost of the system.

"The structure and defense of the country," Arnold testified, require a comprehensive, thoroughly integrated system of controlling and coordinating all types of aircraft—and require it meticulously."

He also stated that, in addition to the improvements outlined in CAA's three-year plan, the master plan should provide:

Master Plan Proposal

• "Complete and constant control of all traffic at the higher, more critical altitudes where air traffic density is more complex, as well as in all high density traffic areas."

• "A new method of communication would communication link between pilot and controller to reduce voice communication and the resulting workload on the controller."

• "A new method of applying to the controller the information he needs for preparing clearance instructions for the pilot."

He said that the new system would require a new method of applying to the controller the information he needs for preparing clearance instructions for the pilot. It would require a new method of applying to the controller the information he needs for preparing clearance instructions for the pilot.

Because air traffic control now looks like modern devices, Arnold observed, there is "an enormous amount of air space in each flight."

Using radar, Arnold said, it is possible to control air traffic in a more efficient manner. He said that the new system would require a new method of applying to the controller the information he needs for preparing clearance instructions for the pilot.

Immediate Steps

So far, no immediate steps are recommended, Arnold proposed.

• **Additional surveys.** He noted that although the Civil Aeronautics Board has ordered scheduled airline service to more new routes, the areas connecting these cities have not been provided.

• **Additional control zones proposed** as a step toward expanding airline service. Expanding the low-altitude and controlled lower altitudes. Arnold also wanted.

The present and status of the work is first showing its effects in the physical and mental health of our travelers who are assigned a straight

eight-hour work shift with no scheduled break at rest periods. If this is the experience at a time when only about 15% of all traffic is controlled, what are we to expect if practically all traffic is to be controlled?"

Pan Air Buying DC-7s With PAA Financing

Rio de Janeiro—Brazil's Superintendência de Correios and Correios finally approved request of Panair do Brasil to buy four DC-7C aircraft and spare parts at a cost of \$15.7 million. Financing will come from Pan American World Airways which owns 49% of Panair stock.

Panair also is getting Pan American's place in back for the new planes, which are scheduled for delivery in April or May of 1957.

Panair now has 10 L-4s, Constellation for flights from Brazil to Europe and the Middle East, and to other South America countries. The new planes will take out the long European and Middle Eastern flights, allowing the company to use its Constellation for "local" flights around South America.

SHORTLINES

• **Aer Lingus' Dublin-Dublin** traffic reported a 20% increase in August over the 24,200 passengers. The Irish airline's month traffic reached 55,000 passengers, 15,000 more than was flown in August of 1955.

• **Air India International** will start a new Australian service on Oct. 5. The Super Constellation service will operate once a week, between Bombay and Sydney via Madras, Singapore and Darwin, and will connect with Air India European flights for through service between Sydney and London, Dordrecht, Rome and Genoa.

• **Alghero Airlines** flew 6,697,000 passengers in August as 11% increase over August 1955. Traffic in the last eight months of the year totaled 42,000,000 passengers, a 16.4% increase.

• **Chicago Midway Airways**, formerly Midway Air Service, completed six years of scheduled operations last month. The carrier handled 21 million passengers in 1956 and completed more than 45,000 hours of flight time in the seven year period.

• **Delta Air Lines** has put its first Convair 440 Metropolitan in service. Delta

The Answer to Jet Age Accessory Power Problems

The need for hydraulic, electric and mechanical power multiplies with every major advance in aircraft performance. The high air speeds of today's jets demand more hydraulic power for aerodynamic surface and landing control. Widespread use of electronic equipment has greatly increased electrical requirements. The blurring surface lines of high performance planes only compound the problem. Not only must today's designer plan an accessory system that can meet increased power requirements, in small but specific, but he must be sure it can operate to last in emergencies.

Since accessory equipment must be used is greatly affected by heat. Direct drives attached to the engine, hydraulic motor drives, and gas turbine power units (GTPEU) are extremely vulnerable to high ambient temperatures. In addition, they generate so much heat in operation that a method of removing the heat must be employed. Other limitations such as inadequate lubricants, heat pumps or the absence of extremely high-temperature metals may prohibit the use of these systems. If these equipment requirements continue to grow.

Heat Problem Complicates The Design Picture

The heat problem has become so complex that jet engineers now realize the importance of integrating the accessory system as part of the basic powerplant and engine design effort. In the absence of adequate alloys to withstand high skin temperatures, designers now use the advantage of installing thermal insulating equipment and shields as part of the airframe design to retain or cool surface areas as well as critical components.

As a reliable, permanent source of compressed air, the jet engine provides the way to solve many of these problems. Air, extracted from its compressor, can be directed in nearly any part of the aircraft surface for purposes of cooling, boundary layer control, and deicing. Since the weight of this equipment is chargeable to the aircraft mission, it becomes practical to use the maximum energy source—compressed air—for operation of the plane's most accessory systems.

Air-turbine Drives Permit Integrated Systems

This trend calls upon importance on the

role and selection of accessory systems. With a compressed air supply already available with the engine, the use of air-turbine drives permits more effective integration of the surface and the accessory system. In many installations, the same air used in the existing surface system can be used to operate small turbine wheels mounted on shafts. These air turbine generators, hydraulic pumps, fuel pumps, thermal-mechanical equipment, mechanical actuators, and other accessories.

The operating history of such now in use is shown in Figures 1-3-2, which show the simple, comparatively featureless construction of air-turbine drives can greatly increase safety and result in longer more dependable service. In addition, they permit more effective paralleling of generators of required, and with a ground source of air can be used without running the main engine.

Install Where Power Is Needed



Turbines Run to Air Blasted From Compressor



All-turbine Power Plant Used In Jet

Operating at that single principle, air-turbine drives can effectively perform nearly every accessory function aboard jet or turboprop aircraft.

Simpler Construction—Greater Reliability

Air-turbine drives are extremely easy to install because they require fewer moving parts than any other method of generating power. Check any efficient rotating turbine shaft and shaft is required to drive the plane's electrical and hydraulic needs. Completely automatic operation is achieved by an integral control system. However, a high-density source of compressed air and existing engine changes the unit's output to meet the power requirements.

Reliability of an air-turbine drive system is achieved by oversampling the plane's air supply from the engine. The method all sorts on the aircraft can operate from one or any combination of engines. In multi-engine aircraft, failure of one or more engines would not result in loss of accessory power as long as one engine remained to supply bleed air.

Air turbine drives and the accessories they operate may be located anywhere in the plane where power is needed. In the B-52, for example, air turbine turbopumps are distributed in both wings and the fuselage—close to the point where power is needed. Such versatile, functional location is possible because air is relatively easy to transport and because it requires no extra system.

Location away from the engine, these drives can contribute to a cleaner airframe design by routing engine bleed air and reducing frontal area. Also, by installing drive close to the "service area," short hydraulic and electric transmission lines are used. This results in a lighter and less complex system.

These advantages permit a significant increase in aircraft speed and range, at payload.

Forecast for the Future

Simplest and Nuclear Powerplants—It is expected that air turbine drives will play an increasingly important role in the future of aircraft with a turbo engine,

the turbopump portion of the engine can be shut down during the emergency portion of flight. This would mean that no reserves will power would be available from the main powerplant for emergency operation. A pneumatic system, however, could provide necessary power under such conditions.

Another solution that more necessary power will be needed in the future exists in the anticipated requirements for nuclear-powered aircraft. Large amounts of power may be needed for specialized functions associated with the reactor. Remotely located air-turbine drives, backed with an auxiliary power unit, could supply a huge block of power without a prohibitive increase in aircraft weight or size.

G-E Pioneered Air-turbine Drives

General Electric's Aircraft Accessory Turbine Department in Lynn, Mass. is one of the nation's prime suppliers of air turbine drives for auxiliary accessory power. Drawing on G-E's vast experience in producing industrial and aircraft gas turbines, this department has consistently advanced the state of turbine drive equipment design.

Just as General Electric pioneered the "valuable" aircraft turbocharger in 1918, through the Aircraft Accessory Turbine Department, it is now leading air-turbine drive equipment to meet the accessory power problems of the jet age. G-E turbopumps and turbine drives supply 8 gpm at 2500 psi and 400 hp at 500 rpm, respectively. They give the lightweight power for operating steering control surfaces, landing gear, launch bays, spoilers, radar, lighting, and armaments.

G-E Fuel Turbopump

This unit pumps air-driven fuel into the tank, provides 100 gpm of vapor-free fuel per acre, gives North America's F-400 its basic operation. Characteristic of G-E air turbine drives, the Air-turbine Fuel Pump is lightweight and compact and can be functionally located in the aircraft.

G-E Turbostarters

Another application of the versatile turbine is in the self-contained turbostarter used on the Martin B-57 which starts a jet engine in less than 10 seconds.

It is powered by hot gases coming from the combustion of an easily combustible solid propellant cartridge. Turbostarters eliminate the need for ground power starting and its attendant logistical problems, and increase jet aircraft availability.



G-E Turbopumps and Turbine Drives Help Power B-52's Accessory System



G-E Afterburner Turbopump Boosts North American F-400's Exhaust Power Reserve



G-E Turbostarter Gives Martin B-57 Rapid Start. G-E Also Makes Fuel/Air Systems



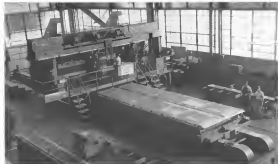
Advanced Air-turbine Drives Are "In the Works"

General Electric's Aircraft Accessory Turbine Department, with facilities valued at more than \$10 million, is carrying out an extensive development program on advanced air turbine equipment. Units with extremely high power to weight ratio are already in advanced stages of testing. These programs promise powerful answers to accessory power requirements that lie ahead.

To find out how G-E air turbine equipment can help you now in the planning stages, contact your General Electric Aviation & Defense Industries Sales Office or write for the descriptive brochure on the drives you are interested in.

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Please send me the following brochures on G-E Air-turbine Drives:	
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GENERAL ELECTRIC



HUGO SEIN PRESS at Lockheed is one more type of machine and whole will be used to sculpture, taper and cut integral stiffeners as structural components of future aircraft. Machine also may be tape-controlled.

Air Future Taxes Production Methods

By Irving Stone

Backlog, Cold-Advanced aircraft design capabilities in the next decade will be the greatest of the manufacturing firms to transfer, then into the hands of hardware. Some of the factors involved are:

- Projected sharp rise in military aircraft performance, including in the use of high strength steel and titanium alloys. These materials generally will be harder to work, will add design manufacturing complications.
- Reduced aircraft space for accessories during equipment.
- Increased machining and forming requirements.
- More precision in tooling fabrication and assembly.
- Closer process control.

These and many other considerations will combine to burden manufacturing with problems demanding for their solution new approaches as well as modification of existing production techniques.

New levels of technical skills will be required in many phases of manufacturing. Manufacturing research will take on new importance. Closest coordination between manufacturing and engineering groups will be required.

Engineers at Lockheed Aircraft Corp., under J. B. Wright, director of engineering, and Herbert Goldhoff, manufacturing manager, have been studying the probable effect of design trends on future manufacturing.

But C. Minicucci, Lockheed vice president and general manager of its California Division, outlined some of the highlights brought out by the study.

Installation, Checks

Increased emphasis in the future production cycle will be on the installation and checkout of electronic, hydraulic and pneumatic equipment. This work, already difficult, will become more so in the future, and future production men learn considerable of specialized training of personnel in not adequately planned.

Initial difficulty will be the limited space available, particularly in future military aircraft for this equipment. Packing the units into tighter quarters will boost the burden of the installer and test his skill. Minicucci said.

The checkout phase in the plant also will be a serious complication, and it'll be aggravated by the limited space in actual amount and complexity of equipment and its automatic action. Prior to installation almost all of the

equipment will require a high degree of qualification training in addition to adequate bench testing.

More technical personnel will be required, specially trained in the various types of machining or checking.

In connection with equipment installation increased use of metal cutters displacing the stress in detail in the shop. Continued consistency with the design phase then will be used to simplify checkout and even problems.

Machining

More machining is generally seen in the picture for future aircraft because of complexity in right location and integral stiffening.

Shift to steel and titanium alloys may increase reduced speeds for more cutting operations, and machine tools for these harder materials will require more power and rigidity. Mathias and coolant supplies may have to be restricted to protect materials to avoid contamination.

Magnetic or punched tapes may be used for control of making operations instead of mechanical methods now employed, if production quantities are small, but this new technology initially will complicate the production job be-



COMPRESSION-FORMING principle (left) used here for C-section, is being considered for bending, pressing, lines and ducts in future aircraft. Press on roller right, to be installed at Lockheed under new will be an difficult variable angle profiling of solid extrusion, such as leg of this. Cincinnati Milacron Machine Co. is building the unit designed by Lockheed under USAF contract.



cause of the specialized training the data processing will require.

Wider application of advanced structural will mean more complex machining of honeycomb core, in steel and titanium alloys as well as in aluminum alloys.

To enhanced cutting forces, support methods with sufficient rigidity will have to be developed for the cases.

Machining Load

The use of extruded materials will cut the need of sculptured or tapered sheet will tend to lessen the machining load. Also, chemical heat treating and chemical coating will find greater application to replace or supplement conventional milling processes.

While using the machining tool, the grinding and chemical coating processes will mean additional production loads in these operations and will require additional floor space.

Smooth surfaces required for very high speed flight will require fabrication of parts to closer tolerances. These will be an increased need for secondary turning operations to act limited parts to exact tolerances.

Many of the forming operations such as those for titanium alloys and steels, will have to be performed at elevated temperatures adding the complications of heating in the production job and requiring adequate training of personnel.

Higher forming pressure generally will be required, particularly for steel and titanium alloys. Load on tool shops will be lower because of increased number, complexity and closer tolerance of tools and the need to make these of harder materials. Shops will require more grinding equipment and generally heavier machine tools.

High velocity forming using explosives is proven, is seen desirable for

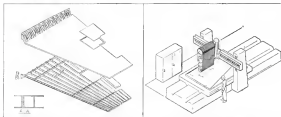
many parts and necessary for some of the harder alloys. This will introduce shuddering problems and the requirement for comprehensive safety training.

Stretch press capacity also will increase from the present 200,000 tons to 1,000 tons within ten years. Minicucci estimates. This will result in much more from greater use of stainless steel and heavy gauge materials.

Compression Forming

Impact extrusion process will require more training to handle steel and titanium alloys. Capacity is seen rising to 200,000 tons in against 100 tons now used for aluminum alloys.

Considerable info. forming will be done on pressure lines and ducts made from steel, titanium alloy and Inconel. Compression forming will be required to make such tubing, and some forming will have to be done at elevated temperatures. Pressure lines will have



PROPOSED WIRE DRAWING (left) forged as two half shafts would reduce assembly operations, but would require drilling of holes and machining or grinding of mating faces and outer contour. Increased sleeve belt grinding activity might use the proposed automatic contact guide (right) for sleeve wrap.



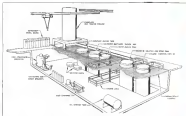
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TRAVELING CONTROLLER—stronger, vertical furnace is being installed at Lockheed for heat-treating steel to high tensile strengths for present and future requirements.

to be maintained up to the material yield strength in least fatigue life, requiring development of long-life and heat cycles to compensate for change of slope under weld residual load.

Surface finish on finished edges is controlled at 750 RMS or better; machine parts with steel and titanium joints requiring harder blending tools than aluminum alloys. Carbide or hard-faced dies will be required.

Processing

Process control will become a major important aspect of the production cycle. Generally all processing will be done under controls involving non-human reasoning and control instrumentation to meet exact.

Some materials now processed will be used, and use of other processes is indicated, including vapor heating, pulsed arc welding, chemical milling for steel and titanium, use of type of column plating for steel, titanium coating, possibly for steel, and heat treatment, requiring baking at elevated temperatures, gas plating, jet-plating for hard to plate parts, hard anodizing for aluminum, surface-finishing shot peening, both for flowing large parts and the controlling surface residual stresses, with more precise control over area and intensity of peening than is now available.

Shot cut belts may be required for prepping cleaning and picking of titanium alloys.

Visions of most gas strengtheners will be required for heat treating new steels and titanium alloys, which will have to be supported in the furnace and divided in the heat treatment cycles of some materials, temperature-dose—1000°F will be used.

If satisfactory optical and light transmission properties can be achieved

high temperature transparent phenolics, epoxies and aluminas probably will be developed.

Transparent Parts

Ultimately transparent parts will be made of heat and shock resistant glass or possibly fused quartz.

A large share of the work in developing high temperature transparent parts will have to be performed in the plant builder's engineering and manufacturing research laboratories.

Increased emphasis will be put on fusion welding for joining steel or titanium alloys. Both automatic tungsten inert gas and shielded metal arc welding equipment will be used. Because these may be a considerable amount of fusion welding for major assemblies, the welding equipment may have to be placed in a large proportion of the assembly area.

There will be more burning with steel and titanium alloys, particularly in sandwich construction using honeycomb cores. Titanium will be done in vacuum or inert gas, and possibly will require continuous recording and control instrumentation. Skipper tooling will be used to protect tapping of parts as the furnace cooling is completed during cooling or quenching. Non-deformable tooling techniques will be used, probably including ultrasonics. New, self-inductive techniques in the heat treating.

Bonding

Use of metal to metal bonding will increase considerably in a present all-bolted method, as a variation in design as compared with mechanical fasteners, and as a variant.

Much of this bonding will be applied to large assemblies such as fuselage panels or benches, perhaps even to com-

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to the point. These subjects will require covering at temperatures up to 2000°. To increase fatigue life, many parts will be bonded and riveted even though welding is not required.

In the future, emphasis will be more on the fabrication of pieces rather than assembly. Moncreath declares this will apply to aircraft small components (such as the F-104 wing) and to larger parts, as would be found in transport structures, which would be made in single pieces to minimize assembly operations.

Metallurgy

The metallurgist will be more closely associated with quality control aspects of manufacturing because of new strength requirements for metals in future high performance aircraft.

Due partly to which he will be concerned will be the heat treated higher heat steels.

Small errors in heat treatment will impact strength characteristics considerably. Moncreath and

Other important considerations, he adds, will be the determination of the effect of various forming procedures on the integrity of the metal, and whether consistent results are being obtained in the elimination of surface residual stress with the shock peening process.

Subcontracting, too, will have to develop higher skills in keeping with the demands of new production techniques. This will be a natural progression as it has in the past, but involving various periods of liquidation.

New equipment also will have to be acquired by the subcontractor, the more in the prime contractor would have to get it if were doing the work in its own shop.

Half-a-Million Pounds Of Beryllium Bought

Half-a-million pounds of pure beryllium—lightweight, nuclear neutron shielding material—have been bought for defense, over the next five, eight from the Beryllium Corp., Reading, Pa. Beryllium has particular advantages in applications where high temperature is a factor and low weight is important. This is typical of aircraft in action, as one example.

The metal is one of those materials commonly considered as moderator and reflector in nuclear reactor design. The others are graphite and heavy water.

The metal has high resistance to corrosion and a high modulus of elasticity in addition to its light weight. It is used as a reflecting shield material in boron neutron back into the reactor without absorbing from

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WORLD'S LARGEST PRODUCTION OF

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Napier Spurs British Rocket Operations

First details on three new British motor engines developed by D. Napier & Son Ltd., underlines Britain's increasing effort to produce rocket-powered operational aircraft and guided missiles.

Two of the engines, the NRE 11 and the NRE 17, are short-life units, specifically designed for guided missiles. The third, NRE 1 Scorpion, is a long life powerplant designed for sustained firing.

All three types have been extensively flight tested in aircraft and missiles.

Scorpion Details

The Scorpion may be intended for use as the proposed next generation of RAF fighters, planned to be powered by a supersonic turbojet engine and auxiliary rocket. One such contender is the de Havilland Ghost II turbojet and the D01 Spectre.

A Scorpion installation was demonstrated at Farnborough this year in an auxiliary powerplant mounted at the rear of the bomb bay of an English Electric Canberra. First engine firings were made in May this year and were followed by a series made over a wide range of altitudes.

Other Rockets

First major production engine project was the NRE 11, a two-stage 1,000 lb thrust unit being used in Rediffusion guided and homing. The engine was capable of being stopped and restarted and either thrust level could be selected during flight. Lower thrust rating has not been given, but the maximum value was in excess of 2,000 lb.

Production began on this unit in 1952, with deliveries slated for some of the experimental missiles and test vehicles of that time.

Further development of the power plant resulted in the NRE 17, a single rocket engine using the same hypersonic combustion chamber and nozzle, which



STATIC FIRING of an experimental Napier rocket engine on a test stand at the company's test site at Luton shows the close flow and close duct discharges characteristic of good combustion. Size indicates a thrust on order of 2,000 lb.



NRE 17 ROCKET ENGINES scheduled for shipment to the newly proving ground at Woomera, Australia, were first Napier production units. These units are liquid-cooled, develop more than 2,000 lb thrust maximum in two stages.

is a design simplification making for easier production. Napier says this unit can be produced in less than half the time of its predecessor NRE 11, and is lighter and more compact.

Thrust rating is presumably the same, at 2,000 lb.

Napier rocket work extends over the last six years. Several types of rockets have been developed and tested by the engineering teams at Napier's Flight Development Establishment, Luton. The rocket test installations there include facilities for proving out various and sub-assembly components as well as complete powerplants. One major feature is an underground test bed where complete missiles can be run in before firing.

A major contribution to basic rocket engine design was made by the company in an extensive series of development tests on combustion chambers, cooling systems and burner head geometry. Research in parallel was conducted on auxiliary units, turbochargers and control valves.

PRODUCTION BRIFING

Connecticut-based Kell, 47 East St. New Haven, Conn., will send samples of their new Kell-F customer owned fabricator to all who write in their typewriter replacements, Kell-F, developed by the M. W. Kilgley Co., is chosen to meet existing and delivery time in J-P and 7 inch and Kell-F



NRE 17 ROCKET ENGINE is a redesign of NRE 11, eliminating the cooling system because of stresses made in increased combustion chamber and nozzle design. Contrast the simplicity and desirability of the engine with the earlier NRE 11.

P6M

This is one of the most important and exciting aircraft in the world. It is the new Martin SeaMaster, the Navy's first multi-jet attack seaplane. It is now in production and soon to be in fleet service as the spearhead of a powerful new arm of the naval arsenal—the Seaplane Striking Force. The SeaMaster's importance is a matter of inevitability: It is in the over 600 mph class, with a normal cruise altitude of 40,000 feet, an unrefueled combat radius of 1,500 miles, and is operable in "Sea State 3" (waves averaging 6 feet) with a payload of 30,000 pounds. Thus, the endless runways of this world's oceans, lakes and estuaries provide unlimited and indestructible bases for SeaMaster operation, making it the first aircraft of any type having global striking power, independent of fixed installations. For virtually the whole of our habitable world is within flight minutes of open water! This new aircraft development is another powerful reason why the U. S. Navy offers to the military enlistee one of the most exciting futures in the world today.



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Scuffy-John and Co., Chicago, pay type after permits, cast place next and around of spined base pins. Blanks. The many pins were sticking up from the shank's shoulder rings.

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the blank's shape and the assembly is loaded in place where the work is given a trim during the pass to rule up cross (inside the shaft) and you save the splash side. The Hral, C. Hough Co., Littleville, Ill. says that the new shaft has increased their production 10-15%.

Consolidated Diesel Electric Corp.'s Canadian subsidiary, Consolidated Diesel Electric Corp. of Canada, has opened its headquarters at Hamilton, Ontario, Ontario. Cons Diesel of Canada will manufacture ground support equipment for jet and rocket aircraft.

Driggs Corp. of America, P. O. Box 9022, Northeast Sta., Newark 4, N. J.



claims that its heavy duty repping machine will feed wire dies up to 1 1/2 in.

American Beach & Marine Co., Ann Arbor, Mich., launching machine set up for automatic launching of 180



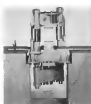
parts per hour. American Beach says they have designed this internal pull-down machine for maximum cooling flexibility.

"Seach-Seal" welder, which forms the flash extrusion as it makes the weld is being introduced by the Thoms



son Electric Welding Co., Lynn, Mass. Thoms reports that all sizes are handled by conventional flash welders can be handled by "Seach-Seal."

Two thousand tons in drastic forging press designed and manufactured by



Lake Fire Engineering Corp., Buffalo, N. Y., for Mather, Lathrop Steel Corp., Danville, N. Y. The single stroke press makes 30 flying circles per minute. The diameter is 48 in. by 90 in with a 72 in. working stroke.

Flights Fabric, Inc., New York City, has opened a new glass fabric finishing plant at Chilton, N. J. Boplen Spinning's Fiber Co. in Danbury has allocated its sales office from New York City to Amsterdam, N. Y.

Australian Sea Venom Grounding Modified

McIntosh-Ross Australia Navy has undoubtedly modified the grounding order for its 11th Fleet 20 Sea Venom at lightning of its aircraft assault carrier 11515 McIntosh (AV) Sept. 5, p. 10.

Tests at the Navy Naval Air Station of the Bay of Australia Navy had tested no serious mechanical defects, but the acceptance of full flying duties is considered as a forthcoming series of long-haul flights and landings to prove the complete acceptance of the fighter.

Further acceptance will be ordered as tests do not prove satisfactory.

New Upholstery Material For Use in Helicopters

Triak, a new, three-dimensional upholstery material recently put on the market in United States Rubber, is being introduced on New York Vertigo 12-September 533 helicopter (AV) Aug. 13 p. 45.

The material is used on the seat, where its three-dimensional quality of low resistance between the person and the seat. It is also used on the floor, walls, ceiling and bed and because of its lightweight in weight around padding qualities and cushioning ability. The material, made of conventional fibers and polyethylene foam is durable and easy to clean, the company said.

MALLORY-SHARON reports on TITANIUM



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Maintenance Trainer

Color Wright maintenance trainer built to teach Navy men more workings of F4U-1 Corsair. Heavy movable parts of detached airplane mounted in welded iron frame on casters. Unit trains men near to Navy Air Technical Training Command at Memphis, another is planned for Pacific Fleet later in year. Second Italian trade was required to carry 14 and valves, light unit is three-section surface controls section measuring 25 ft. in length. Wherever possible units are made from actual parts of F4U as personnel can more readily visualize airplane. Parts include whole cockpit, electrical system, landing gear and steering gear, fuel system and engine controls, air conditioning system, wing fold, variable camber wing and landing flap doors, speed brake and rocket pack, hydraulic power system, electrical power system. Fuel system and engine control stand include engine rotating system to that starts, engine runs and shutdown show on panel. Each of seven units has provisions for instructors to introduce "trouble." They picture shows land gear and steering link and failures, cockpit section.



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Janitrol air couplings for the Navy's new P4M-1 SeaMaster, saving 75 pounds in coupling weight over the "X" version. Each SeaMaster attack seaplane uses Janitrol high-pressure, high-temperature couplings on bleed air ductwork... for many reasons beyond the weight reduction alone.

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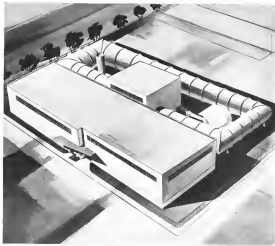


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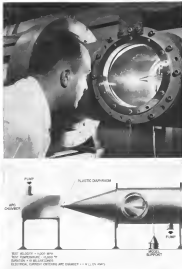
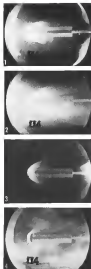
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Hot Shot Wind Tunnel Hits Mach 15

First pictures of Arnold Engineering Development Center's Mach 15 Hot Shot wind tunnel show rapid construction of the new USAF test facility at Dayton, Ohio, (AW Sept. 17, p. 10). Hot Shot was the discharge of a windmill of expansion across an air chamber to heat a diaphragm and send a relatively long duration hypersonic blast past a test model.

The step of high speed remains past the test model (7,000 ft/sec) down the air chamber steps the model's response to the 10 million ft/sec. The air flow starts past the model's rounded nose in the first frame, moves to peak velocity of 11,000 ft/sec which produces 15,000° in the shock envelope

in the second frame, begins to lose speed and becomes in the third and ends with the nose of the model still glowing in the fourth.

The researcher in the upper right hand picture is looking at another model (with pointed cone shape nose) in the 15 in test section.

The bottom picture shows the layout of Hot Shot. (Actually the open view angle of the nose is about half that which the artist has shown.) The pump, pump, and electric are on the two sides of the diaphragm.

Not shown are the banks of expansion which release these shocks across the air chamber.

Arnold engineers warn that the test

model discharge actually heats over portions of the tunnel ducting and lots of glowing motion metal strike the model during the latter phases of the test. However they claim this one temporary develops later than it ever really does in steel-tube types of hypersonic tunnels and is preceded by a longer, more uniform flow in which solid test data can be recorded.

The hypersonic facility is being used to explore possible methods for cooling the surface of models and aircraft as they encounter speeds which are well up on the slope of the thermal barrier. The tunnel was designed and built by ARDC Inc. the operating contractor to the TRC ARDC/USAF center.



C-130 pilots have NESAs® windshields for good visibility

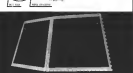
Lockheed's C-130 Hercules is the Air Force's best performing transport. It is built to fly higher and faster and longer (and more economically) than any existing military transport. The cargo compartment is much larger than a standard railroad freight car. It will carry about 30 tons of cargo.

This is truly a workhorse airplane—and it must be, ready to fly in all sorts of weather. NESAs® electrically heated windshields were selected to protect the pilot against the hazards of icing and fogging. Technologies are so close that windshields are directly interchangeable between different models.

Our Technical Representative will be glad to discuss difficult aircraft glazing problems with you. Just write to Pittsburgh Plate Glass Company, Room 6381, 632 East Duquesne Boulevard, Pittsburgh 22, Pa.

This is NESAs, a transparent, electrically conductive coating applied to the glass in a cavity from the fuselage. Electrical energy is delivered to the NESAs surface by feed-on bus lines located on opposite edges of the glass. A circuit with NESAs easily contains moisture temperatures rising almost to prevent overheating of the interior or exterior.

Self-cleaning surface capabilities of the bus lines to provide heat dissipation to a typical NESAs windshield of about 1100 BTU/hr sq. ft., enough to melt ice and prevent fogging.



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AVIONICS

Vortac Catches Industry Off Balance

By Philip J. Klein

Distance measuring equipment (DME) for the newly adopted Vortac civil navigation system is slated to become available from one avionics manufacturer late next year and at least two other suppliers hope to have Tacan compatible (color-channel) DMEs available by late 1976 or early 1977.

However, the Air Coordinating Committee's recent decision, following two meetings in which the prospects of civil DME and competitive Tacan alternatives were hot and cold, has roughly equalized manufacturers' oil balance, as AVIONICS WIRE spent much time.

Federal Telecommunications Laboratories, which developed Tacan, is moving rapidly to exploit its know-how with the hope of crushing the ultracompact aircraft market. FTL expects to flight test a prototype Vortac DME within three months. The unit, which weighs about 30 lb and is housed in a one-half ATR size case, will provide distance (mile) information when operating with either a military Tacan ground station or a civil version which the Civil Aeronautics Administration will install at present VOR (omni-range) stations.

In value/weight equations, the FTL unit is expected to sell for around \$5,000, with initial production aimed

able by late 1977, a spokesman told AVIONICS WIRE. By adding another one-half ATR size unit, weighing about 15 pounds and costing around \$1,000, both Tacan bearing and distance information can be provided.

Other avionics manufacturers have not yet established firm plans or time tables, Avionics Wire's spot check reveals.

• **Boeing Radio** expects to have Vortac DME equipment available by 1978-79 to meet airline jet aircraft needs, a spokesman says. Boeing, which previously marketed a civil DME built by Hoville, expects to develop its own Vortac DME.

• **Collins Radio** says it can have a Vortac DME available by late 1978 or early 1979 providing the always an willing to accept a three-quarter ATR size unit instead of the one-half ATR size called for in the Aeronautical Radio Inc. specifications for civil DME. Collins, who the DME can operate into a one-half ATR case, but this will allow equipment marketable by 5 to 12 months. More important, Collins believes that the reliability of the Vortac DME will offset its spread into a one-half ATR case size because of civil designers' problems reaching from such high density construction.

(Collins originally operated in the one-half ATR size specified in the old Army civil DME spec, based on its ex-

tensive experience in developing a ruggedized military Tacan receiver for the Navy. Some of Navy's early reliability problems reportedly stemmed from overloading due to its high density construction. The one-half ATR spec's made more difficult by avionics, reflective to its ultracompact nature, Collins says. However, FTL says it has developed new simplified concepts which in combination with use of silicon devices will enable it to meet the one-half ATR requirement.)

• **Nasco (National Aeronautical Corp.)**, whose civil DME has been shelved by the recent ACC decision, is waiting for the dust to settle. An ACC's support, to aid in its Vortac deliberations, Nasco furnished an oral estimate of the selling price (with annual distribution work up) for an untested standard (pre-war) Tacan receiver, comparable in design/manufacturing techniques to its popular Omega-10. On this basis Nasco estimated that it could market a Vortac DME (distance only) for about \$5,100 or a complete distance-bearing Tacan set for about \$4,100. A Nasco spokesman says the company's price is to maintain its position as a supplier of a line of proven equipment, but that for new Vortac DME development will probably have to take its place behind the firm's present work load.

• **Strumborg-Carlson Cos.**, which together with Hoffman Electronics Co.

AVIONIC INDUSTRY SALES, EARNINGS UP

Company	Period	Sales	Change From 1955	1956 Profit (After Taxes)	Change From 1955	Earnings Per Common Share*	Change From 1955
Amphenol	6 mo	\$13,999,356	+22%	\$428,446	+47%	\$1.34	+49%
Consolidated Electronic Corp.	6 mo	12,854,126	+32%	568,147	+92%	0.90	+94%
Hoffman Electronics	6 mo	22,495,561	+31%	733,972	+87%	1.57	+87%
Eldec Industries	12 mo	13,080,080**	+70%	950,360	+105%	0.90	---
Radio Corp. of America	6 mo	338,481,080	+8%	30,037,080	-19%	1.23	-10%
Servo Corp.	6 mo	1,412,130	-29%	170,080	-32%	0.21	---
Strumborg-Carlson	6 mo	7,264,472	+17%	387,447	+35%	0.48	+33%
Texas Instruments	6 mo	19,289,917	+49%	1,039,847	+44%	0.13	+66%

* After provision for preferred stock, if any.

** Fiscal year ending 7/31/56

*** Not comparable because of new name which was listed in American Radios, Oct. 1955.

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Progress

The recent Air Conditioning Conference Vortex symposium ending several years of bitter controversy between VOR/DME and the military Tacon system, is the case plan originally proposed by the Defense Department more than three years ago to get around the frequency conflict between civil DME and Tacon.

Aviation Week's article (Dec. 7, 1959, p. 46) which first revealed the existence of the controversy reported "The military was believed to have proposed that CNA change its current in-process DME station to the new military (Tacon) system. If this were done and new civil air-based DME were designed for the military system, three units would get only distance information when they substituted the improved CNA ground stations."

"Military aircraft, equipped with the full Tacon set, would get both distance and bearing information. Civil aircraft would continue to use VORs (non-range) to get bearing information."

is a second source producer of military Tacon receivers, it is the focus of a shrewdly calculated move to crush the entire DME market, a spokesman says. Lacking airline marketing/servicing experience, Stromberg Carlson might consider an assignment with its established surface receiver supplier, much like the one which Honeywell worked out with Bendix Radio.

Specifications Needed

Except for TIL, potential Vortex DME manufacturers are waiting for the Air Navigation Development Board to come up with General Service tech spec characteristics for the new DME. Until ANDB sponsorship, Airlines Industries Laboratory (which did much of the investigative work on the Vortex controversy) has drafted a proposed specification. ANDB is currently waiting to see if the draft fits Air Force specs, which ANDB Director D. K. Martin hopes will be ready within 60 days.

Another detail which must be worked out is the pricing of Vortex DME for agencies with VOR and ILS frequencies so that joint selection of the desired VOR station frequency will automatically tune in its corresponding DME frequency. ANDB has given this problem to the Naval Air Station at Stennis which earlier conducted extensive Tacon frequency allocation studies in connection with moving the Tacon/DME bank. Martin expects the frequency pairing specs to be worked out without difficulty also within 60 days.

Ann's Airline Electronics Engineering

ing Committee (ADEC) is going to work to revise its old civil DME characteristics. In all emphasis will be given to one size, industry type, and some concerning wiring, because such refinements is critical, immediately by primary manufacturers. Arinc hopes that the Vortex DME can fit the same in increasing wiring and test cases as the old civil DME. It used changes in airframe design, according to William Camas, manager of electronic engineering.

Indicator Type

One big change is in the type of DME cockpit indicator. The original Arinc spec permitted the use of a vorticity type of distance indicator in order to accommodate the existing Navco DME design. However, Camas believes that the digital counter type indicator is preferable, to avoid degrading the accuracy of distance information available from Vortex DME.

Arinc hopes to get out its preliminary DME characteristics, dealing with form factor and wiring, within 30 days. That will be followed later by a more complete characteristic spelling out the detailed equipment performance specifications. However, Camas points out that Arinc has several other high priority characteristics in process, including angle of arrival, air traffic control signal-



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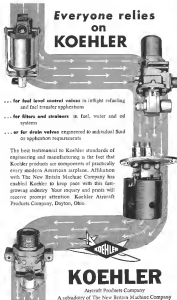
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CAA Flies

The recent ACC Vantage device has changed a stable work load on the CAA, already burdened by its expanded traffic control program. In order to meet the ACC requirement that Vantage DME facilities for high altitude enroute and terminal operations be open by July 1, 1973, the CAA may be forced to modify some of its practices in the procurement of radial civil Tera ground station equipment, a spokesman says.

To meet the ACC deadline, CAA may buy a limited number of modified military UHF-3 Tera ground stations—modified to include dual equipment with microwave switches in event of failure.

Subsequent procurements would then be made in accordance with civil CAA specifications.

Combined Strife

CAA currently is investigating the problem of co-location of VOR and Tera ground stations at Philadelphia. By using techniques derived by Rome Air Development Center, a combined VOR/Tera station requires a larger building to house the equipment, a larger VOR receiver case and additional power.

The Philadelphia investigation will provide the CAA with information on the cost and time involved in the VOR co-location building it to plan its timetable. It may also suggest ways to telegraph the concerns to maintain direct line.

After several disturbing years of uncertainty, the ACC decision has clearly authorized the industry's emergence for a much-needed attack on pressing traffic control problems.

Westinghouse Makes Cheaper Rate Gyro

Pittsburgh-Westinghouse Electric Corp. has declared a cheaper more sensitive rate gyro dropped around the rotating turn principle. This is the principle used by the aircraft industry to sense flight stability.

Called Vibogiro, the Westinghouse device is expected to cost only a fifth of what present rate gyros cost. Turn output is expected to have a sensitivity of from 95 deg per sec to 100 deg per sec. Essentially, Vibogiro uses the output of two vibrating masses to give a frequency signal on shafting axis.

A smaller vibrating mass type of gyro developed by Sperry Gyroscope Division of Sperry Rand Corp., was described in detail by Aviation Week in its November 25, 1973 issue, p. 57.



Radiation Tolerant 500C Devices Shown

Some motor (upper left) and transducer (upper right) capable of operating at 500C temperatures were among devices recently displayed by General Electric to show its progress toward development of high temperature, radiation-tolerant engine components and devices. (AW Sept. 30, p. 112)

Exhibit of 500C temperature on engine assembly constructed from conventional components and another using area GE components is shown in side-by-side comparison at right.

Mid-shaft motor (lower left) can tolerate heat now GE components is also used to heat that successfully passed over 1,000 hour test in nuclear reactor under high neutron flux density and 410C temperature. Device was known to hold up to 1,000 hours for reactor tests.



FILTER CENTER

- **For Experimental Use**—Sample quantities of General Electric's new high temperature capacitors, resistors, and transformers, capable of operating at temperatures of 500C or higher (AO Sept. 10, p. 111) will be available soon to promote manufacturing for experimental use. Samples will be available from GE's Specialty Electronic Components Dept., Auburn, N. Y., transformers from GE's Specialty Transformers Dept., Elmsford, Ind., and 500C rated capacitors from company's Capacitor Dept., Madison Park, N. Y.
- **Mistake Inertial Guidance**—AC Spark Plug Division of General Motors has revealed that it is producing the inertial guidance system used on the new Marine Mustang (YMO-610) surface-to-air missile.
- **New Ceramic Tube Types**—General Electric soon will announce six new types of ceramic vacuum tubes, all triodes, designed specifically for military applications and capable of operating at temperatures of 1000C. The six types will cover range of output up to 100 ma. Sample quantities should be available late this year.
- **Less Abroad—Sockets** will outfit its SAAR J15 supersonic lightning coils. Less substitutes. Eight control systems. Less production R. M. Mook reports.
- **Ford ECM—Metal chaff** used for electronic counter measures, which dropped on a cluster from an M16A1 N. Y., covered a number of "bird" deaths among hungry scientists who ate it and the rest of the flock is following as an indication the Associated Press reports. Emission is not too far from Ford Air Development Center which conducts extensive ECM tests.
- **Solar Power To Get Cheaper**—Substantial reduction in the cost of making mirror solar cells should cut the cost of generating electricity, by 20 cents from the present \$600 per watt to approximately \$10 per watt, according to Dr. M. B. Peierl, research director Hoffman Electronics Corp., San Jose, California.
- **Industrial Progression Studies**—Reports on two industrial progressions studies due on innovation and innovation manufacturing equipment and the other on silicon power transfer, sponsored by Army Signal Corps, are now available from Dept. of Commerce, Office of Technical Services, Washington, 25. D. C. Transistor report consists of two

volumes PD 111822, 200 pages, \$5.00, and PN 111820, 42 pages, \$1.25. Subsequent studies report in PN 111819, 42 pages, \$4.00.

► **Radar ADRP—Flash-mounted** antenna design which develops a good radar pattern at 1,500 mc., similar to that of a low frequency ADF loop and wave antenna, was described in a Western paper by F. D. Clapp of the University of California's Electronics Research Laboratory and H. Masuda of Hughes Aircraft Co. By providing a suitable rotary feed, Clapp and Masuda say, the design could provide a completely flash-mounted direction finding antenna. This prompts speculation that the antenna could be used for an ADF operating against ground radar stations.

► **New UHF Transistor Structure**—New technique for greatly increasing the high frequency capabilities of transistors by getting closer directly into the space charge region of a silicon based P-N junction, as suggested by Wolfgang Gartner, Signal Corps Engineering Laboratories, is a paper delivered in Vienna. Gartner calls the new device a Definition Layer Transistor. The Signal Corps Laboratories is experimenting with the new type UHF transistor, Gartner indicated.

Expansions, Changes In Avionics Industry

Little Industries, Beverly Hills, Calif., will purchase Tread Transducer Corp., Los Angeles, and Hi Indium subsidiary, Ulm Corp. The new acquisition, which make instruments, sensors, wave filters and related products, had sales of \$1.5 million last year, while Little's sales were \$15 million.

Other recently announced expansions, changes and additions in the avionics field include:

- **Westinghouse Air Arm Division** will add 70,000 sq. ft. of floor space to its present Baltimore facility. Completion is scheduled for Jan. 1, 1957. An Arm expansion has moved from 3,300 to 4,400 in the past six months and the figure is expected to double in the next year, according to Dr. S. W. Horvath, division manager.
- **Loat, Inc.**, has opened new instrument research and development building adjoining its other facilities at the Santa Monica Municipal Airport.
- **General Electric's Microwave Laboratory**, Palo Alto, Calif., becomes part of GE's Power Tube Dept. as radio as



Project Vanguard Minitrack

Minitrack, also known as Vanguard, developed by North American Instrument Co. for the satellite, will transmit 105 mc. signal enabling ground stations to track satellite movement. Small crystal controlled transmitters are miniature, weigh only 13 oz. Unit puts out 10 mW watts, is powered by mercury batteries.



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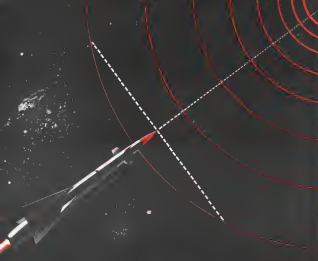
Head of AVIATION WEEK's technical staff, Asst. Managing Editor David Anderson, worked in the missile industry on an early ballistic missile weapon system and as a chief project engineer. He is currently attending the International Congress of Astronautics Meeting in Reno as a delegate. Other staff members have had practical experience in the industry in missile propulsion and avionics before joining AVIATION WEEK. The 24 man editorial staff of AVIATION WEEK, combining professional editorial experience with practical technical knowledge of the industry, is unmatched in the aviation publication field and is particularly suited to provide the most complete and technically accurate coverage of the rapidly expanding missile industry.

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S-55 MAINTENANCE WORK at Boukad. Two squadrons of Helicopter Group 97 are equipped with eight S-55s (type H-10D) each.

Special Report from Algeria, Part II:

Algerian Terrain Challenges Helicopters

By Robert Farrell

Boukad, Algeria—This small French air base helicopter base is located 50 mi. southwest of Algiers. Though at sea level, Boukad is within 20 mi. of rugged mountain ranges, where better flying (against rebel) forces occurred. In almost every skirmish, helicopters from Boukad played a big role.

Set up 15 months ago, Boukad is due to a potential strength of 180 or, including 100 pilots and 200 mechanics. Commanded by Col. David, the base, though coming out as active flight operations, is already, still in the process of being built. Hangers for trucks and maintenance facilities are under construction. Helicopters lack up routine, dark stores at their land on the dirt field.

Algerian Helicopter Group 97 at Boukad, re-equipped of four squadrons.

The first squadron owns 15 Bell 472Cs, built under license by the Agosta firm of Milan, Italy, equipped with auto-controls. The second and third squadrons are composed of eight S-55s each (type H-10D). The fourth squadron is equipped with the new Sikorsky S-55s, or H-10As, one of them recently crashed.

The initial report from the crash scene indicated pilot error. The ship was carrying 12 passengers in a combat situation when it went down. The accident involved the second S-55 each since June, when the air force at Boukad first began operating the new helicopters. The first accident, a training flight, was also blamed on pilot error.

The air force helicopter unit at Boukad, is entirely at the disposal of General Command in western Algeria. (The Army helicopter group generally handles western Algeria.) An Army officer here up three ground missions to carry troops into mountainous combat areas very often at 6,000 feet, and then to various outposts.

Wounded, sometimes, are usually flown to base hospitals within an hour of being hit.

In addition to troop carrying and evacuation of wounded, which is up to 75% and 10%, respectively, of Boukad's helicopter missions, the air force unit also is used to supply remote outposts and to ferry downed French pilots.

Big Area

Understandably, all these missions couldn't be carried out from the base at Boukad. Take as an example the case of the U.S. east of the Mississippi River and you have approximately the size of Algeria. Divide the area in half from the Mediterranean to the Sahara desert and you have the region that must be served by Boukad's battle-old helicopters. So is better across the trip, the bulk of the group's ships are engaged—usually in groups of three—in ground work throughout western Algeria up to the Moroccan border. A helicopter task force stays in the field on the average of three days, sometimes more if a big operation is being run off.

Since its beginning in June 1955, the Boukad helicopter group has staffed up the following official record:

- Troops downed, 10,782
- Troops transported, 35,681
- Wounded evacuated, 1,571
- Freight carried, 283 metric tons

Recent Record

These figures run up to the early part of August. Since wars at Boukad, 44 helicopters, mostly the big S-55s, have been operating each, mostly from June or June 4's better to look at a recent month's record. That, in fact, with some fresh old helicopters available, including ten S-55s, the group's official record is as follows:

- Troops downed, 1,244
- Troops transported, 1,242
- Wounded evacuated, 417
- Freight carried, 44 metric tons

Incidentally, of the 1,244 for down in July, 1,213 by reported actual operations in the field against the enemy.

A further study of the July operations reveals an interesting comparison between the work load of the S-55 and the S-55. During the month, an S-55 carried 1,477 Commandos in 97 hours of flying time. By contrast, an S-55 carried 1,940 Commandos in only 86 hours of flying. Boukad's efforts for the S-55s have been carrying from 10-17 Commandos at altitude up to 6,000 ft.

Night missions are carried out only on emergency call. But some air force officers think certain day missions are a waste of money. They claim the ground forces are now so well on helicopter that often the craft are used in areas where traditional foot marching would be just as good and a lot cheaper. "The ground forces just don't appreciate how much it costs to run these machines," complained one air force officer.

Expensive

According to figures worked out at Boukad, it costs about \$500 an hour to operate a Bell 472C as low as for a S-55 and \$400 an hour for a S-55.

So far no helicopter operating out of Boukad, has been involved down in serious fire, though many have been hit repeatedly by small arms weapons. One S-55 at Boukad, for example, has 32 bullet holes.

As a rule pilots near the base, and the air force is planning to erect light armor platoons under the pilot's seat and back seat. Seven out of ten hits enter the aircraft through the bottom half. This is one reason why Boukad S-55 pilots are glad the main fuel tank, located under the cabin, is self-sealing.

While French army helicopters, like the S-55s, pilots at Boukad, they flew wing month before helicopters. Most of them have had 900-700 hours on other Outposts, Morocco or T-44s (back in France, however, many of the air force helicopter missions



AN AIR FORCE BELL, built under license by Agosta of Milan, Italy, landing at Boukad.

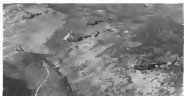


FIGURE 133A, on a mission from Boukad, flying over rugged Boukad area of Algeria.



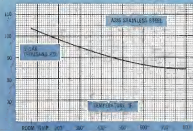
REFUELING COMPLETED at advance base, crew waits call from ground forces.



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\$58, the French are this haven't logged enough engine time to know how the propeller will stand up. But since the Vis isn't being pumpeled at Boudier, it's just that the engine will last a considerable life span.

The 260 hp Lycoming on the Agusta Bell is looking as long as the manufacturer said it would. This is much because the Bell's tough metal construction, are rarely overflooded.

For the moment, Boudier represents the only Air Force helicopter base in Algeria. But Air Force officials talk of an expansion program that reportedly is under way. It is supposed to be completed early next year. At that time, the Air Force expects to have in Algeria 60 S 58, 50 Bells and between 20-25 S 15.

In preparation for the expansion the Air Force reportedly plans to set up two more helicopter bases in Algeria. Boudier will continue to serve central Algeria, a new base at Ouan will handle western Algeria and a third base at yet unidentified will be located in eastern Algeria.

This expansion, of course, implies a break with the present system under which the Air Force operates in northern Algeria while the Army runs its helicopters in eastern Algeria. Naturally, the Army is opposed to the move. In fact, the French Army doesn't like the idea of the Air Force transporting ground troops.



New Troop Seat

This new, lightweight, foldable troop seat has been developed by Kellett Aircraft Corp. in comply with military specifications MIL-S 5500A. The seat can be stored against the side wall when not in use, so it can be rolled into a compact package for storage. The seat has been approved by the Air Force, according to the manufacturer.



Night Suit

Discussed suit showed for use by British Navy "bomber" planes, which require night landings on carriers. Lighted suit (above) is of use to pilot approaching carrier at night. Lt. Col. Stuart Secord (below), commander of the unit, models it.



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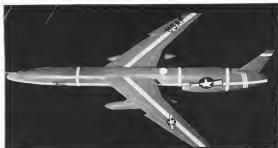
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If you are an applicant, please send your field of specialization

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Snark Details Viewed by Public At Aircraft Show

Pylon-mounted underwing auxiliary fuel tanks are featured on a scale model (top photo) of the Northern Snark guided missile displayed at the National Aircraft Show, Philadelphia City.

Closeup (right) details intake of the XNM-62 Snark shown at the air postcard, also the rear portion of the two four-wheel dollies. The model is now loaned to Rich Stearns Ltd. the Allison J71, later version here a P-40-117.

Then outfit with "cassette" loading clip as detailed below. View of the 74-ft.-long Snark (right) shows compartment, dome jet exhaust, housing a pendulum and its Snark recovery. Snarks have underbody and wingtip slots for loading.





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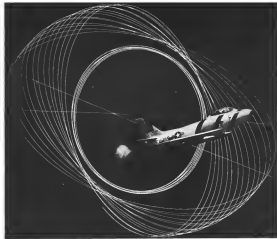
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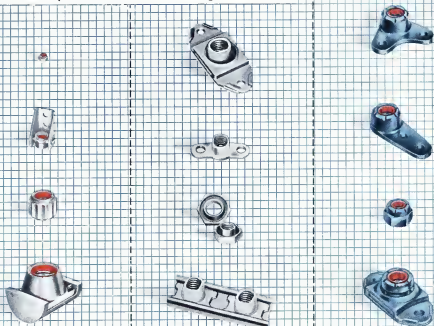
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